I proceed to give a brief history of the Jecker contract for the survey of the State of Sonora.

In the year 1857, Messrs. Juan Bautista Jecker & Co., Don Antonio Escandon, and Don Manuel Payno, of the city of Mexico, on the one part, and J. B. G. Isham, of San Francisco, California, on the other, entered into a contract for the survey of the public lands of Sonora. The contract was based upon a grant to the house of J. B. Jecker & Co. by the general government of Mexico, the terms of which were an absolute transfer of one third of all the public lands (terrenos baldios), with the right of purchasing any portion of the two thirds remaining to the general government for cash, in preference to any person offering the same sum. The condition of this grant being an accurate survey, with maps, of the public lands, with the most exact description possible of the climate, productions, and advantages for commerce and agriculture. The time allowed for this survey was three years.

By a series of deeds, this contract became vested in the hands of Jecker & Co., J. B. G. Isham, S. W. Inge, J. Mora Moss, Wm. M. Lent, and James E. Calhoun. A scientific commission was organized under the command of Captain (now General) Charles P. Stone. Perhaps never before was so excellent an organization for a similar purpose, consisting of so many accomplished men in each department. Vessels were purchased for the survey of the coast. The head-quarters of the commission were fixed at Guaymas, and the survey carried on for a long time with a vigor and accuracy which promised an early and successful completion of the work, thus securing to the contractors a property whose value can hardly be estimated in ordinary figures.

Difficulties sprang up between the state government and Captain Stone, which at first delayed, then entirely paralyzed the work, and, finally, the scientific commission was expelled from Sonora by the government of the state.

It is no province of mine to enter into the merits of this difficulty. There are two radically different versions: On the one hand, Captain Stone being charged with violating the laws of the state, and fomenting revolution; on the other, it is claimed that the state government's action was illegal and uncalled for. The commission proceeded to Arizona and built a little village, where it remained idle for months. Captain Stone appealed to the U. S. government for protection, and demanded to be reinstated in his rights in Sonora. The U. S. government did not sustain him. Negotiations with eminent capitalists for more funds in New York, all completed, were broken up by the continued opposition of the government of Sonora, and other causes, and the work has not been renewed.

The regular protests and legal steps were taken to secure the rights of the owners of the contract, and a very able opinion from Caleb Cushing as to the validity of the contract, and its binding character on the Federal Government of Mexico, was obtained. This opinion was answered at length by Mr. Monteverde, Secretary of State for Sonora, in a paper which is claimed by his friends and the opponents of the Jecker contract to be able and conclusive.

About $250,000 was expended in the survey as far as it had progressed, and a much smaller sum would have completed the entire work. It should be added that this contract in no way invalidates private titles to lands or vested rights. It includes the "terrenos baldios"—that is to say, "all the property of the Federal Government, waste lands, the old presidios, the Jesuit and Franciscan Missions, the lands of barbarous tribes of Indians, enemies of the white race, who have never submitted to the laws; and, lastly, the lands occupied by private individuals to which they have no legal title, comformable to Mexican laws."

From the letters appended, it will be seen how much had been accomplished. I was in Sonora in 1858, and saw a considerable portion of the work, and since many of the maps. They do great credit to Stone, Jasper and Robert Whiting, engineers, and to the other gentlemen of the survey. It is hardly necessary to add that the owners of the Jecker contract fully believe in its validity, and in their ultimately receiving the benefits of it.* They are men of capital and enterprise. They undertook and carried on the work in good faith, and in a manner commensurate with its magnitude and the great return they were to receive. The benefit to a state of such a survey can not be overestimated, and it is doubtful if it would have been undertaken, except under a liberal contract, for many years.

Extracts from Correspondence of Captain Stone, Chief of Commission.

Guaymas, May 19, 1858.

The engineers on board have carried their work on Pinacati Bay about thirty-six miles, which will bring in between seven and eight hundred thousand acres more of public lands. They have also surveyed George's Island.

For the past ten days I have had a party at work on a large rancho about four miles from town, which extends six and seven leagues on the coast. This survey enables us to stretch up the coast and take in some public land in that direction.

June 11. Specimens of minerals and dye-woods are constantly brought me, and I can now, on my own knowledge, declare Sonora to be the richest in natural productions of the states of Mexico which I have seen, and those nearly all.

July 11. I have ready two more detail maps, embracing about 400,000 acres, and there will be a third nearly ready containing 375,000 more.

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* It is stated that Mr. Jecker has been recognized as a French citizen, and will receive the protection of the Emperor Napoleon in asserting his rights in Mexico.

July 31. You may be confident that, once settled, the lands of the Yaqui Valley will exceed those of Texas in her best parts. Three crops can be grown there each year, and the soil is inexhaustible. Had I half a million, I would venture it, knowing what I do, on this enterprise. I send you detail maps Nos. 2, 4, and 5.

Aug. 15. I send you detail map No. 8. Before this letter reaches you I shall have notes for mapping the whole of that portion of the coast south of Guaymas, one hundred miles of coast near Tiburon, and a large body of lands adjoining that coast. These surveys will embrace many hundred square miles of the most valuable lands in the state, and nearly all public lands.

I assure you that, with a little patience, this contract must turn out many millions. If I am not crippled for the want of funds, I shall have the entire coast for a depth of thirty to forty miles; the entire north line for an equal depth; the entire southern line, and a part of the eastern, accomplished before the end of winter; but if funds fail, I shall be forced to abandon the grandest and richest enterprise which has been undertaken in this country by private individuals.*

The action taken by the governor diminishes our labors immensely, for now I am not obliged to measure separately the private lands, but work as best I can, and your rights under the contract are "conserved, although the limits may remain pendent through the action of whatever civil or military authority or tribunal of justice."

I have just dispatched a new set of maps, furnished for the use of the judge who, during these troublous times, is to hold his sittings in Mazatlan, and on the approval, the titles to all surveyed will be issued immediately.

You will thus soon find yourself the owner of some millions of acres not taxable.

Survey of Sonora, Office of Chief of Commission,
Guaymas, Nov. 25, 1858.

Col. S. W. Inge, Washington, D. C.:

At Mr. Moss's request, I have had constructed, and herewith inclose to you, a map, showing the amount of work done. It shows all that we can now send in, but not near all that we have partial notes of. Slight reconnoissances will enable us to use a great number of notes which we have on hand, but which require connecting explanations.

I beg you also to see immediately Doctor Thomas Antisell, the geologist appointed for the commission; he is now in the Patent Office.

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* The foregoing letter was written before Messrs. Inge and Moss advanced the money named in their contract with Mr. Calhoun.

Please furnish him with three thousand dollars—two thousand on account of pay, and one thousand with which to purchase instruments, etc.—and dispatch him here by the Overland Mail. His services will be of immense value, both before and immediately after annexation.

The lands surveyed in the Yaqui, Mayo, and Fuerte River valleys are rich beyond estimate, and immense bodies of them are public land.

Dr. Antisell will be invaluable in getting possession of mines, selecting those of value, and rejecting those not worth the trouble and expense. You have the foundation of one hundred great companies in your contract—great land companies and great mining companies.

Do not lose one moment in communicating with me after you receive this, and please send me authority to draw on New York and on San Francisco, for, if I must carry out the entire contract under the estimate, I must have funds so as to not be obliged to contract the operations.

You can not, so far away, conceive even the value you have. Do not allow the matter to fall through by delay, which will be as bad as abandonment.

I shall write you by every possible opportunity, and send maps as fast as they can be constructed. I have a beautiful chart of this port and neighborhood, but can not get it copied in time to send now.

Captain Davis has commissioned Mr. Whiting (one of our engineers) as his clerk, and made him bearer of dispatches to Fort Buchanan, whence they will be forwarded by the commandant.

I remain, dear sir, yours very truly,

Charles P. Stone, Chief of Commission.

The development of the mining interest of Sonora by American capital has largely increased during the years 1863 and 1864. Many new mines have been opened, and the prospects of nearly all are good. Among the most prominent mines opened lately are Las Cruzecitas, Corral Viejo, and El Refugio, the latter on the border of Chihuahua. Trade with San Francisco has largely increased, and is increasing.

CHAPTER VI.

THE MINES OF LA CANANEA AND LA CIENEGUITA, SONORA.*

La Cananea: Early Working of the Mines.—Don Ygnacio Perez.—The Sierra of La Cananea.—Condition of the Mines in 1860.—Their Situation.—The different Mines.—The Ores.—Chamunque.—Access to the Mines.—Assays of Ores.—*La Cieneguita:* Situation of the Mines.—Early Working.—Their Abandonment.—Titles.—Location.—The Mines.—The Hacienda.—Fuel, Water, Building Materials, Wages, Provisions, etc.—Résumé.—Assays of the Ores of La Cieneguita.

La Cananea.—When or by whom the mines of the Cananea were first opened is lost with the missing mining records of the State of Sonora. Long periods of revolution, which checker the annals of that unhappy province, have caused the dispersion and destruction of the archives, and have even extinguished the faint and flickering torch of tradition.

Seventy years ago or more they were worked on a large scale, and with great energy, by the house of Guea, of Chihuahua, but when that house went down in the disturbances which marked the advent of the century, the mining enterprise was abandoned, and remained in abeyance till the epoch in which Don Ygnacio Perez reestablished their exploitation. On the death of the elder Perez, his son, the second Don Ygnacio, continued the works but a short period, when, either from pecuniary embarrassment or Indian troubles, he stopped all operations on the Cananea, devoting himself exclusively to the care of his numerous and extensive haciendas.

Subsequently to the great rising of the Apaches de

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* Reports of Robert L. D'Aumaile, Mining Engineer and Assayer for the State of Sonora.

Paz in 1834, Don Ygnacio Perez recommenced operations in the district under the superintendence of his brother Don Francisco, and ultimately under that of John P. Brodie, who erected new reduction works, and continued in charge till their final abandonment, owing to the failure of the proprietor, and renewed Indian difficulties in 1837. Don Ygnacio Perez retired to Mexico, where he died about three years since in deep poverty, leaving his affairs in inextricable confusion. His widow, a daughter of General Urrea, remains in Mexico; his son, Francisco, resides in Ures. Two surviving brothers, Felipe and Francisco, reside in Arizpe and Ures respectively. None of these have any legitimate claim on the mines of La Cananea.

The Sierra of La Cananea is situated about twelve leagues southwest of the presidio of Santa Cruz; about eighteen southeast of that of San Pedro; probably thirty-five miles southerly from Fort Buchanan, and not far from the American line. The mines (worked) are seven in number, of which the principal are El Ronquillo, La Chivatera, San Rafael, Santo Domingo, La Mina de Cobre Pobre, and La Mina de Plomo de Arvallo. In addition to these are La Mariquilla (of white copper), El Tajo (the ancient mine), and others; in fact, the whole region is strongly mineralized and of most prepossessing exterior. The Hacienda de Beneficio of Perez & Arvallo is on El Ritto, a permanent stream at the foot of the mountains, about a mile or a mile and a half from the mines. The greater portion of the road is excellent, and the remainder can be readily made so.

The Governor of Sonora* being strongly impressed with the extent and value of the mineral deposits of the

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* La Cananea is the property of Don Ygnacio Pesqueira, present governor of Sonora. It is said a large capital is to be invested in this mine by foreigners.

Cananea, at his request I undertook its exploration, and in the middle of March of the present year, under escort of Don Santiago Garcia, Prefect of Arizpe, visited the locality. We found the old hacienda a mass of ruins, overgrown with rank vegetation, but the new one erected by Mr. Brodie in such a state of disrepair that an expenditure of half its cost would probably suffice to restore it to its pristine condition. All the machinery had been destroyed by the natives in order to steal the metal-work, and most of the roofs had fallen.

The situation is pleasant—on the borders of a vast plain, covered with wild horses, which stretches away to the San Pedro; and much arable, with any quantity of grazing land, lies immediately around the site. Half a mile or so up the valley brings us to the mine of El Ronquillo, called also, from its refractory ores, La Maletiosa, with its ancient hacienda. This mine was the property of Arvallo, and in dispute with Perez, who never worked it, being driven off by the Apaches. Government could not supply me a guide, and all the information I could obtain on this and the other mines has been drawn from various, scattered, and irregular sources, and should not receive entire credence. I consulted all the existing books of the enterprise in Arizpe, but they threw no light on any thing except the most obvious of all, San Rafael.

El Ronquillo has a thickness of three and a half or four feet of very rich ore, worked to a depth of eighty feet. It has several mouths, is full of water to the brim—which water comes from copious springs in the lower workings, and a ravine which passes across the vein—and, from its situation upon the gentle slope of a hill, which gradually merges into the plain beneath, can not be drained by a tunnel, but recourse must be had to steam machinery. No ore of this mine was found in the débris or the hacienda; but I ordered search made in all the slag-heaps, and the lead extracted, of which the assay is annexed, shows that the ore was extremely rich.

Passing up the ravine, we crossed in the path more than one outcrop of copper ore, into which a pick had never been struck, but which, on assay, yielded a fair percentage of copper, and a quarter of a mile above reached the mine of La Chivatera. La Chivatera is situated on a steep declivity, admirably adapted to tunnel-drainage, and is half full of water. It bears every external evidence of being a powerful vein, but I am assured by Mr. Brodie that it is really an irregular deposit. The ores are various, of copper, silver, and lead, those of copper prevailing. The teneros are full of good ore, and at their feet flows a permanent stream, unfit for use from mineral impregnation, but well placed to wash the rubbish. In fact, the ore thrown away in the teneros, lying in the haciendas, and metal wasted in the slags, would form a respectable fortune for a man in Europe.

Three hundred yards higher up lies a great open cellar, for I can compare it to nothing else, with a small pile of refuse lying at one side: this is the mine, or Tajo of San Rafael. Judging from the small amount of earth visible, and the statements of the old administrador, it is nearly a solid mass of ore. You have ore on all sides in the level, so that it is impossible to tell where the vein is. This ore is ductile and most easily reducible—it flows like water in the furnace. The supply is apparently inexhaustible.

Farther up the glen is the Mina de Plomo de Arvallo, of the same character as San Rafael. The ores of these mines appear to consist principally of oxide and sulphate of lead, although vast masses of galena are found, and are so soft that a single barretero can throw down many tons a day, while the cost of extraction is nothing. The holes appear of trivial dimensions, and yet they have been worked from time immemorial, and the litharge, or jugas, from San Rafael have supplied all Northern Sonora with that necessary article, and they have ever formed an article of export to Jesus Maria and other great mining towns of Central Chihuahua.

Continuing our course and passing some false veins, we reach the mine of Cobre Pobre. The ore of this mine is boundless in extent, but of inferior quality, and I paid it but little attention. Near this point is the great vein of La Mariquilla, which I could not find for want of data, and of course did not visit. I had been assured that it was in the Sierra of la Mariquilla, four leagues to the northward (and it seems there is some mine there), and that the discoverer was dead and the site nearly forgotten. This mine, from its great alleged dimensions and the richness of the ores, had great interest for me, especially as the cause of its abandonment was the fact of its producing white copper. I had hoped that it might be a counterpart of the "paktong" of China, or the white copper of Hildburghausen, the prototype of German silver; but the accounts were so obscure, conflicting, and contradictory that I could make nothing of it.

Felipe Perez, sent by his father when a boy to learn book-keeping at the hacienda, recollects distinctly being shown it once by his father, who remarked, incidentally, that it was a magnificent vein, but useless, as it yielded nothing but white copper. He places it in the Sierra of the Mariquilla, but his organ of locality is so bad that he loses himself in his own garden. Francisco Perez, who received $1000 a month from his brother to *repoblar* (literally to repopulate) the Real, asserts, on the contrary, that there never was any mine of white copper, but that this designation was applied to the grayish alloy of copper, lead, and silver extracted from the "arenillas" of La Chivatera. Brodie, in turn, confirms Felipe's statement, professes to know the vein well, and says that he smelted into one pig a number of small ingots left in the hacienda by the elder Perez and dispatched it to Hermosillo, where it was examined by Gandara, old Monteverde, and the other experienced miners, who pronounced it silver, but professed themselves unable to purify it. A similar occurrence fell under my notice in Mulatos. Brodie describes it as having the qualities of copper when smelted, cooling brittle, with a coarse grain, and the color and other properties of impure silver.

El Tajo, the most ancient mine, is a huge rent in the earth like the Panys Mine in Anglesey, but the ores changed at the depth of thirty feet, suddenly, into pyrites. It is probable, from analogy, that these pyrites are argentiferous. Immense masses of a black rock were abandoned by the ancient miners in the walls under the supposition, probably, that they were black slate, it appearing to me that they resembled a semi-stratified silicate of the dinoxide of copper. I carried away a fragment, whose analysis verified my conjecture. Other mines of argentiferous galena, varying from twelve to 3200 ounces per ton, are alleged to exist near the Ojo de Agua de Arvallo; but, having seen them, and entertaining very little hopes of seeing the latter, I forbear dilating on their alleged extent and productiveness.

Of all these mines, the only one which needs steam power for its drainage is El Ronquillo, and the oaks (former growth), though they have not recuperated perfectly since the days of the old metal-seekers, are yet so abundant as to afford an ample supply of fuel for that purpose and the uses of the reduction works. Besides the oaks, there are vast and most accessible forests of *chamunque*, a species of pitch pine of great strength and durability, excellently adapted for machinery and building materials.

To convey an idea of the strength of this chamunque, I may mention that one of the legs of my portable cot, made of the best quality of ash, having yielded to the strain and broken, I replaced it by a piece of chamunque from the ruins, of much less area, and, despite twenty-three years of exposure to the inclemency of the weather, the substitute answered perfectly, being stronger, in fact, than when first hewn.

The mines are accessible by a good wagon-road *via* Santa Cruz from Fort Buchanan, Tubac, la Piedra Parada, and Guaymas, and are surrounded by the great (depopulated) haciendas of San Bernardino, El Ojo de Agua de Arvallo, another Ojo de Agua, Cuitahasa, el Agua Escondida, Las Animas, and Bacanuche. Another road, *called* a wagon-road, passes by Bacuáchi, Arizpe, Ures, and Hermosillo to Guaymas. Its position is romantic and delightful; pasture exists green in Bacanuche all the year round, and of most nutritious quality. Cultivable land of considerable extent is found in the same hacienda, which is the natural feeder of the Reál. The mines themselves are said by Felipe Perez to be on public land—a narrow strip or *sobrante* between three ranchos. All the necessaries of a great establishment—building material and fluxes—abound in excess. Building stone, granite, fine marble, tepustete arenillas, jugos, and ayudas, are plentiful, and during my search for the lost mines of Las Lamas and Espiritu Santo on the road to Bacanuche, I found a vast deposit of most refractory furnace sandstone, the first I have seen in Sonora.

The water is good and the locality healthful, and its proximity to the American military stations of Fort Buchanan and Arrivaypa would render feasible a project of united action against the Apaches, who operate at a disadvantage in the wide plain that stretches away to San Guaycheque and the San Pedro.

Assays were made in Arizpe from the 24th to the 29th of March, 1860, of ores from the Cananea and metal from the scoria of the smelting furnaces, the latter to determine the richness of the ores formerly reduced, and to dispel a universal vulgar error extant in Arizona and Sonora to the effect that the copper of La Cananea and Santa Rita de Cobre contained from 0.80 to $1 00 of gold per Spanish lb. The following were the results:

Assay No. 785. .500 grammes lead from slags of San Rafael.
Silver—.092 per cent. =3 marcos, 5 oz. 7 adarmes por tonelada de 2000 lbs.
Gold—traces.
Assay No. 786. .500 gms. lead from slags of El Ronquillo.
Silver—1 per cent.=2 m. por quintal=40 m. por ton.
Gold—1 oz. 3 ad. por ton.
Assay No. 787. 2000 gms. copper from slags from old hacienda.
Silver—.075 per cent. =24 oz. por ton.
Gold—traces. Not determined.
Assay No. 788. 2000 gms. copper from new hacienda.
Silver—.11 per cent.=41 oz. 12 ad. por ton.
Gold—too insignificant to determine.
Adulterants—lead, carbon, iron, sulphur.
Assay No. 789. Ores of Baranuche.
Assay No. 791. .205 gms. pure galena (ayudas), Ronquillo.
Lead—83 per cent.
Silver—1 per cent.=32 oz. por ton.
Gold—slight traces.
Assay No. 792. .100 gms. (false ore) metal de todo brosa, Ronquillo.
Silver—1.25 per cent.=40 oz.
Gold—large quantity.
Assay No. 794. .100 gms. copper ore, La Chivatera.
Silver—.037 per cent. =12 oz. por ton.
Assay No. 795. .100 gms. same ore.
Copper—32.5 per cent.
Lead—20 per cent. (by calculation).
Assay No. 796. .100 gms. copper ore from untouched outcrop.
Silver—none found.
Copper—32 per cent.
Assay No. 797. .100 gms. yellow ore of La Plomosa.
Silver—.165 per cent. =52½ oz. por ton.
Gold—traces.
Lead—estimated in 60 per cent. Very fusible and docile.
Assay No. 798. .100 gms. metal negro de San Rafael.
Silver—.20 per cent. =64 oz. por ton.
Gold—good ley.
Lead—not determined, but muy reseco.
Assay No. 799. .100 gms. ore of La Escalera.

Silver—.08 per cent.=25 oz. 10 ad. por ton.
Gold—good percentage.
Assay No. 800. .100 gms. dinoxide copper ore of Cumpas.
Copper—80 per cent.
Silver—none.

ROBERT L. D'AUMAILE,
Ensayador Oficial del Estado de Sonora.

Arizpe, 29 de Mayo de 1860.

LA CIENEGUITA.—Having concluded the explorations which I was commissioned to make in relation to the mines and Reál of the Cieneguita, I hereby embody, as succinctly as possible, a general résumé of the results of my labors.

The Reál of the Cieneguita embraces in itself and its dependencies the mines known as La Chipiona, La Colorada, La Cagona, La Prieta, and the vein of copper in Matarachi, La Descomulgada and Los Tajos, La Viruela and El Realito, San Rafael, Ostimuris, Yerba Buena, and El Potrero. All these mines, with the exception of El Potrero, which is at some leagues distance, are found within a radius of three miles from the central point, and the great Veta Madre, or principal vein, appears to be that of La Chipiona.

The origin of the Reál is shrouded in the mists of antiquity. Tradition even fails to indicate the period when, or the person by whom the mines were originally worked; but the general belief, based upon ancient maps and landmarks, identifies it with the long-lost Reál of Tayapa, famous in the early Spanish annals. The district surrounding it constituted the mining province of San Yldefonso de Ostimuris; but of the actual state of the mines at that period the sole evidence remaining is tradition, and the information which may be gleaned from an inspection of the excavations made and the ruins left by the former possessors. The testimony of the oldest and most reliable inhabitants, resident near the spot from infancy, is unanimous to the fact that in the early part of the present century the Reál remained in the same condition, under the same circumstances of abandonment and decay, and that the uniform tradition of the country assigned to them, even then, a high and unknown antiquity.

Subsequently they were repopulated by Rafael Valenzuela, who worked two of them with great success, and were again abandoned on the general uprising of the Opatas.

The only modern veins opened were those of San José del Pinar, now exhausted, and Yerba Buena, whose mouths are closed by the falling in of the pit framing.

The abundance of ores of the Chipiona, Colorada, etc., was generally known and recognized, as also their richness; but, owing to their belonging to the class termed in the technology of the country rebelde (*i. e.*, refractory or hard ores, sulphurets, etc.), the native miners have been unable to extract the silver.

Titles.—The mines, except those of El Potrero, La Prieta, and the copper vein in Mataracbi, are on the rancho of La Yglesia, a fine grazing estate of eighteen square miles in extent, belonging to and in the occupancy of Don José Yrenéo Monge. The title is said to be perfect and undisputed—a Spanish grant of Carlos III. It is wooded and watered, and contains sufficient arable land.

The rancho of Matarachi, which bounds it on the westward, is a beautiful pine forest, with some excellent cultivable land, contains nine square miles, well watered, and is likewise a Spanish grant of the last century. It contains the vein of La Prieta and the outcrop of copper.

The title to these deposits is a "denouncement," as discoverer, of four *pertenencias*—twenty-four Mexican feet in length, with an appropriate width, depending on the inclination of the vein. The mines of Los Tajos, La Descomulgada, and El Realito, each four pertenencias as *repoblador* (*i. e.*, repopulator). El Potrero and La Viruela, one each. La Chipiona and La Colorada, possession given by the Prefect of Sahuaripa on the 13th of September—1800 feet in length, with 600 on La Plomosa, and 1350 in width, including all the present workings in the three mines. The sites called El Potrero, La Amargosa, La Cieneguita, and Yerba Buena, denounced as "haciendas de beneficio"—positions for reduction works.

Location.—The Reál of the Cieneguita is situated in a pretty little dell, embosomed among lofty wooded mountains, almost at the foot of the Sierra de San Ygnacio, and partly embraced by the unbroken ranges of the great Sierra Madre. Owing to the impossiblity of procuring the requisite instruments, I was unable to determine the latitude and longitude. It is distant, by the road, fourteen leagues southeast of Sahuaripa, three leagues southeast of Tarachi, and four leagues west of Mulatos, little more than half that amount. The Reál contains perhaps twenty acres of cultivable ground, admirably adapted for gardens, and is supplied by springs and a never-failing brook of excellent water which traverses its centre.

The climate is mild, delightful, and probably wholesome; but in winter the snow is said to fall occasionally two feet in depth, and ice to form in the creek as many inches in thickness. The stalwart frames and robust health of the octogenarian proprietor of La Yglesia and his lady might be envied by many a tobacco-chewing American of thirty-five. The road which leads to the Cieneguita and Mulatos from Sahuaripa is mountainous in the extreme—from Aribechi to the Reál, a distance of ten leagues, it is nearly all mountain, except the plain of Los Cazadores in the rancho of Agua Blanca and the valley of the Rio de Ostimuris, upon which the road runs from San Francisco to Tarachi. A considerable portion of the Reál is covered by foundations of houses and ruins of smelting-works, or immense piles of scoria and rubbish, proving incontestably to the practiced eye the vast extent of the mining operations formerly carried on in the Reál.*

The Mines.—Leaving the Reál, the road runs up the brook northwest, and about three hundred yards distant from the hacienda is a working of trifling depth in the bank of the stream, now filled with earth, called *La Cargona.* All that is known of it is that the metal is said to be plombiferous, the vein (metallic portion) one foot in width, and the ore to pay sixteen ounces to the hundred weight. Mr. Ortiz has never examined it, on account of the influx of water from the rivulet adjoining.

Two miles distant, in the same direction, lies the hill which contains the veins of La Chipiona, La Colorada, La Plomosa, and another, fallen in, whose very name has perished. The veins have been opened in many parts by the Spaniards, who, according to their almost invariable custom, contented themselves with sinking shafts for the extraction of the superior decomposed ores, abandoning the mine on reaching the sulphurets, from ignorance of the process for the extraction of the silver. In these sulphurets, and below the old galleries, are situated the present workings.

La Colorada, on the north side of the spur, is a portion of the Veta Madre (or main vein), and the workings are firm and perfectly dry. The part explored by Mr. Ortiz is about fifty feet in length and forty-five feet in depth. This is exclusive of another twenty-feet shaft eighty feet farther down the mountain, where the ores are uncovered to the same width, and are said to be identical in quality, but which, from oversight, I neglected to examine. The vein in the lower planes (levels) is about eighteen inches wide, in parts thirty, running north-northwest and south-southeast, with an inclination to the southeast of about 15°—an excellent course and dip in Mexican mines. The ore from this, as well as all other accessible mines, was blasted from the seams in my presence and under my direction, and the assays are made of the general average of the ores in the vein, without much care being taken in removing the adhering vein-stone. The assay of this portion is marked in the table of assays 690.

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* The vast extent of the ancient works in the mines of Northern Mexico and Arizona, taken with the fact of the undoubted richness and abundance of ores at present, give a guarantee of permanency for these mines which those of California and Nevada Territory can not yet claim. This is a material point, well worthy the careful attention of capitalists seeking mining investments.—S. M.

La Chipiona is also upon the Veta Madre, the vein having the same direction and dip as in La Colorada. The shafts are two in number, some thirty feet asunder, and about the same number of feet in depth. They are now partly full of water from the heavy rains and suspension of labor, the miners being engaged at present in their planting-grounds. The vein has a width, in the lowest accessible part, of twenty to thirty-six inches, exclusive of the vein walls, and is said to carry the same depth and quality of metal down.

The ores are of a class somewhat different from and more difficult of reduction than those of the Colorada, being "bronces apetancados" (bisulphurets of iron, with a compound sulphuret of silver, iron, lead, and copper), and are said to give in the German process 160 ounces per ton of 2000 lbs., and contain alloy of gold. The ores of La Colorada give, by the same process, 212 to 320 ounces per ton, according to Mr. Ortiz. Assays marked 691–2–3.

Not half the superficial excavations of the ancient miners upon this vein have been cleaned out, and the falling in of their *labores* can be traced all the way across the crest of the hill—say 250 yards—up to the mouth of La Colorada. Above the main vein is a cross vein of four to six inches, cutting it nearly at right angles. Its ore is said to yield 318 ounces of silver per ton. The assay will be found marked No. 693; but it is believed that this ore was somehow confounded in the transportation with that of the lower shaft of the main vein (No. 692).

Nine hundred feet distant, in a straight line, in a spur of the same Cerro, is the adit of *La Plomosa.* The upper workings, being badly planned, have recently fallen in from the pressure of the rubbish in old drifts, and the miners have driven a level in the solid rock one hundred and fifty feet farther down, which has advanced fifty feet, but has not yet struck the ore. They are argentiferous galenas, with a matrix of stratitic "calishe," said to yield eighteen per cent. of lead, and ninety-six ounces of silver per ton. I assayed one of the isolated masses taken at random from the excavations of the drift, which gave a higher percentage. The assay is marked 694. Both this vein and La Chipiona run across the valley and strike the opposite mountain. The yawning mouths of the old mining shafts are visible all the way across in many different points.

All these points are dry, except from the infiltration of surface water from the workings and rain flowing into the uncovered shafts, and even if worked to a great depth are capable of being drained with comparative ease by means of a tunnel, as the Chipiona debouches upon an abrupt descent of many hundred feet. The walls are firm, the vein regular, and presenting every indication of permanence. There is more ore stripped and in view in La Colorada and La Chipiona than that lying in the patios.

A quarter of a mile southwest of the Yerba Buena are the mines of *Los Tajos.* The hill-side is covered with the buried workings of the ancients, and the superior portion of the vein is in a very precarious condition. Mr. Ortiz has driven a tunnel in below, to avoid the cost and trouble of removing the rubbish. Having mislaid my notes on the vein, I am unable to speak with precision, but it is something like half a yard in width, with a very heterogeneous medley of ores.

It runs completely through the mountain, as very considerable works are visible on the opposite side, but whether "en metales" or not is not known. The ores are contracted to be delivered, clean, in the patios at $4 per 300 lbs., and are said to yield sixty ounces of silver per ton; but they are loaded with titaniferous and zinciferous minerals. Assay of such ores as were accessible marked 695.

La Descomulgada is situated about a league west-northwest of the Yerba Buena. Its matrix is a very hard silicious rock, which crumbles with great rapidity under the combined influence of air and moisture. The recent rains had filtered through the old workings into the drift made by Mr. Ortiz, and brought down a portion of the ceiling, so that access was impossible, and I can give no description of it. The vein is said to be wide, and the superficial ores so easily worked that contracts were made to deliver it, dressed, in the mine mouth, at $1 per 300 lbs. It is said to give 130 ounces to the ton, and to be of easy reduction.

La Yerba Buena is a modern mine—said to have been very rich—whose mouths have fallen in, a few hundred yards from the Yerba Buena, on the road to the Descomulgada. Nothing more is known concerning it.

Los Ostimuris, on the road to Yerba Buena, about half way from the Cieneguita, has two open mouths, and is full of water, the drifts running under the brook. Mr. Monge says it was abandoned, with abundant ores, on the outbreak of the Opatas, and, as the shafts were shallow, the vein wide, and the ores yielding four hundred and fifty ounces per ton, he entered into a contract with a skillful miner, and put up wims and machinery for drainage. His partner died just as they were approaching completion, the Apaches drove off the animals, and, being entirely ignorant of mining, he abandoned the enterprise.

La Prieta, on the rancho of Matarachi, about two leagues east of the Cieneguita, has a width of from four to six feet—the opening is merely a trial-pit, which the rains had filled with earth and stones, so that it is impossible to give any opinion concerning it. The ores of the outcrop are a melange of different sulphurets, heavily charged with copper. It is probable that a much shorter, better, and less circuitous route than that which leads past the Reál of the Cieneguita can be cut through the woods direct to Buena Vista. Assay of ore (which can not be regarded as a fair sample) marked No. 696. They are said to yield sixty ounces to the ton. The copper vein, also a trial hole, is situated on the crest of the hill directly above.

El Potrero, eight leagues distant, I did not visit. It is said to be an immense "clavo," of volcanic origin, and unknown extent, at the intersection of two veins. The ore is without alloy of silver; but, containing much oxide of lead and spar, it forms an excellent flux for the ores of La Prieta and Los Tajos. The cost of carriage is the only expense.

La Viruela, east half a mile from the site of La Amargosa, is a lofty hill, from which large quantities of gold have been extracted; but the whole hill (summit) has fallen in, and all attempts to establish workings to reach the ores beneath, without removing the superincumbent débris, have resulted in failure.

La Amargosa, and the rivulet which runs beneath El Realito, are constantly washed for gold. The gambusinos told me that they realized about six reals per diem.

Hacienda de Beneficio.—The existing hacienda consists of two small patios and lavadero of masonry (part of the ancient works), three tahonas or arrastras, two vasos de fundicion, one melting furnace and one reverberatory, with the requisite sheds, three barrels mounted on the German plan, a worthless battery of three stamps (à la Mejicana), and the proprietor's residence. These are situated in a group in the centre of the valley. There are other buildings and inclosures not connected with the hacienda.

The water of the creek is not sufficiently abundant for machinery, and an examination was made of La Amargosa, one fourth of a mile east, which, by a moderate expenditure in ditch and tunnel, might be diverted from its course and brought through the Reál. This stream is permanent, and furnishes a considerable volume of water, with a natural fall of 100 feet, within a space of 100 yards, in its own valley. As my measuring instruments were lost [illegible] crossing the Rio Grande, these estimates must be considered in the light of guesses, though I am convinced that they are close approximations to the truth. The connection of these two streams has been advocated by a German engineer, but, in my opinion, on very untenable grounds; as, in addition to the expense, all the advantages which this sudden fall presents for the erection of a reaction water-wheel would, from the conformation of the ground, be almost entirely lost.

In *La Amargosa* are the ruins of a dam, race, and reservoir of masonry, two tahonas de agua, houses, etc., a standing memorial of miscalculation and bad engineering. Around the base of the hill which contains the Chipiona, and not over 400 yards distant, flows a stream capable of giving motion to two large wheels, but which is said to afford water in times of drought only four months in the year. I consequently paid no more attention to it.

The next point examined was *Yerba Buena*, from two to three and a half miles southeast from the Reál, four to four and a half from La Chipiona, and about one fourth from Los Tajos. The river is the Arroyo de los Ostimuros—water permanent ten months, and sufficient to turn the wheels during the remainder of the year. An excellent natural foundation for a dam, of solid rock, exists here at a waterfall, the distance between the abutments being only twenty-four feet, and no leakage of any kind being possible. The natural abutments are about twenty-five feet high.

Water sufficient for saw-mill, flouring-mill, and hacienda de beneficio of considerable extent. By my measurement, rudely taken, a race and flume of 1250 feet would, with a six-foot dam, give a fall of full sixty feet—ample for all practical purposes. A natural tail-race, which needs but little deepening, is found at this point.

Situation good and pleasant, with plenty of garden land, building stone, arrastra stone, oaks, pines, some ash and juniper. Here are the remains of a long line of sheds, which were once the smelting works of Los Tajos, those of La Descomulgada and Yerba Buena being farther down the creek. This location, though somewhat distant from the principal mines, is favorable in every other respect. The road to the Cieneguita is rocky and bad, but a good one of regular descent, in soft earth, is said to exist on the outer side of the ravine.

Fuel, Water, Pasturage, etc.—The subject of water has been fully discussed under the head of Hacienda de Beneficio. Wood is abundant to excess. The mountains and valleys are covered with a plentiful, often heavy growth of oaks (live oak, holm oak, and other species), white and pitch pine, etc., while juniper and ash are found in the water-courses in quantities sufficient for purposes of construction.

Pasturage of excellent quality is found every where, as the forests are free from underwood (from the frequent bush fires), and animals are said to fatten all the year round.

I may add that Mr. Ortiz undertakes to procure from the proprietor of La Yglesia a free and gratuitous concession in perpetuity of the right to take, use, and enjoy all the wood, pasturage, and water power which may be needed for mining and reduction of metals, and all other purposes incidentally connected therewith.

Lime, Stone, Clay, and Building Materials.—Limestone is found in various parts; it has been sought for, and is not known to be abundant. Stone of a very refractory character, for furnaces, falls in the same category, as it is not known to exist nearer than Sahuaripa. Clays abound, those of a talcose nature especially, but none known to be fireproof. Fire-clay is said to be met with near Mulatos, and Don José Maria Lopez, who is certainly competent to judge, assures me that there is a large bed of superior quality building stones, and timber is inexhaustible.

Labor, Wages, Provisions, Carriage, etc.—All the laborers employed in the mines unite the profession of ranchero or farmer with that of miner; but I am assured by competent authority that any amount of skilled labor, if required, can be drawn, without the slightest difficulty, from Mulatos, Jesus Maria, La Trinidad, Tarachi, and Valle.

The wages are, for tentateros,* barreteros, arrieros, peons, etc. (miners and general mining laborers), four reals per diem; azogueros, afinadores (not required in the German process), $1.

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* *Tentateros*, those who pack out the ore, in sacks made of hide, on their backs. *Barreteros*, those who use the bar in the mines. *Azogueros*, the amalgamators in the patio process. *Afinadores*, refiners by the cupel or "vaso."—Four *reals* is fifty cents.—*Fanega*, 175 lbs.—*Ley*, the amount of precious metal in ores.

Wood, at present (but can be supplied much cheaper), one real the carga of eighty billets; charcoal, two reals the hundred weight. Salt, $8 to $10 the carga of 300 lbs.; maize and wheat (selling price), $6 the fanega. Wheat and Indian corn can be purchased in the Tierra Fria at four reals the fanega (of Vizcaia), and contracts can be made for its delivery at the Reál (in quantity) at an advance of about 500 per cent. on cost price, say $3 50 to $3 75 per fanega (of Sonora).

Freight from Guaymas, $80 to $90 per ton; from Sahuaripa, $3 per carga (300 lbs.); cattle, $10 to $15; hides, $1 each; mules and horses, dear; powder of the country, $7 per arroba (of 25 lbs.); tallow, $7 per arroba.

Résumé.—In recapitulation of what I have said before, my opinion is that the mines, alluding particularly to the Veta Madra of La Chipiona, are of excellent quality, the ores of good ley and abundant, and of facile extraction. I have found, in conversation with old and experienced mine-masters in different parts of the country, that the richness of the silver of the "bronces," "prietos ó quemazones," and "metales espejuelosas"—pyrites, blendes, and mixed sulphurets of Cieneguita—has been generally known to those conversant with mining affairs, but that their known "rebeldia," the impossibility of extracting the precious metals by the antiquated and inefficient processes of the country, has rendered their reduction a hopeless task. This difficulty is completely obviated by the use of the German process of chlorinization with sal marina and subsequent amalgamation—a process for which they are peculiarly adapted. It is to be observed that two items of expense in most of the mining districts of the republic—*jugos* and *magistral* ("fluxes")—are not incurred here, the ores yielding a surplus of these essentials for sale in less favored quarters. The mines are in the solid rock, with firm walls, without slips or outthrows, and all expense of timbering galleries and shafts will be spared the mine-owners; but the ores are hard, and require blasts for their extraction.

I would recommend sinking two shafts of one hundred varas in the workings of La Colorada and La Chipiona (should the ores, which is probable, extend so far), to thoroughly test the vein, running a drift from the pit bottoms to connect, and then working the vein from below upward, before the expense of creating a very large hacienda be incurred.

Labor, except of skilled artisans, is abundant and cheap in the immediate vicinity. Wood and water power for every needful purpose abound, but the distance of the most eligible site of the latter can not be less than four miles from the Chipiona.

Pasture and tillage-ground is afforded to any required extent by the ranchos of La Yglesia and Matarachi. In fine, if the ores continue, as they give every promise of doing, the amount of silver extracted will depend entirely upon the extent of the operations, and the energy, skill, and economy of the management.[*]

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[*] Since the visit of Mr. D'Aumaile we have received samples of ores of the "Descomulgada," which the proprietors have lately been working: the vein is wide, the ores easily extracted, and the ley flattering. The "Ostimuros" mine is at present full of water, but can be cleared at a small expense; the reports of its richness are very flattering. From what I have learned from Mr. D'Aumaile, the proprietors, and others, the sites for forming "haciendas de beneficio" are numerous, and the water power which can be brought into action will move more machinery, applied judiciously, than will be needed for working the mines. Timber for the erection of the works is abundant, as also copper ore, which metal can be used with greater economy than imported iron for castings that may be required. At a comparatively small expense, excellent roads can be formed from each of the mines to the hacienda, as well as to the adjoining towns. As stated at the commencement of this, these mines can only be worked with success upon a large scale, for many reasons—at least $200,000 is required.

Assays of Ores of the Cieneguita, September and October, 1859.

No. 690. La Colorada, 172 oz. silver per ton of 2000 lbs.
Gold, trace.
691. La Chipiona (upper shaft), 224 oz. silver per ton.
692. " " (lower shaft), 318 " " "
693. " " (cross vein), 190 " " "
694. La Plomosa (from new adit), 108 " " "
696. La Prieta 30 " " "
721. " " (bell-metal ore), 21.54 per cent. copper.
697. La Chipiona (bronces), 160 oz. per ton.

Assays of ores brought by Sr. Ortiz—Nos. 835–842:

Assay No. 835. Ore rejected in the "terreros" as worthless, Bronces ochavados.
Silver—3 per cent.=12 marcos=96 oz. per Spanish ton of 2000 lbs.
Gold—much stronger standard than in 836.

Assay No. 836. Average of ore now taken from La Colorada.
Silver—5 per cent.=20 marcos (160 oz.) per ton.
Gold—as in 841.

Assay No. 837. Ore of superior quality (Petanques hechos), La Colorada.
Silver—65 per cent.=26 mar. (208 oz.) per ton.
Gold—heavy ley not determined.

Assay No. 838. Decomposed superficial ore, La Descomulgada.
Lead—20.4 per cent.=408 lbs. per ton.
Silver—.3696 per cent.=14 m. 6 oz. 1½ adarmes (118 1-11 oz.) per ton.
Gold—.335 oz., or ⅓ oz. in each marco of silver.

Assay No. 839. Ore of El Potrero—qualitative analysis.
Silver—very small ley; gold not sought; lead, antimony, copper.

Assay No. 841. Assay for gold of plata de fuego. La Colorada.
Gold—1.5025 oz. per quintal=3 mar. 7 oz. 3 och. (31⅜ oz.) per ton.

Assay No. 842. Assay for gold of plata de fuego. La Descomulgada.
Gold—2 oz. 15 gr. per quintal=5 mar. 5 och. (40⅝ oz.) per ton.

ROBERT L. D'AUMAILE, *Assayer*.

CHAPTER VII.

THE SIERRA MADRE OF NEW MEXICO.[*]

Mineral Wealth of Northern Mexico.—The Sierra Madre.—Mining under the Spanish Dominion.—Ancient and Modern Mines.—Present Modes of Mining.—The Miners.—Gambusinos.—Their Mode of Working.—Causes of the Decay in Mining.—Habits of the Miners.—Borascas and Bonanzas.—Expulsion of the Spaniards.—Withdrawal of Military Forces.—Ravages of the Indians.—Lack of Machinery.—Various Causes for the Abandonment of Mines.—Necessity for Foreign Capital and Energy.—Inducements for its Investment.—Political Relations of Sonora and Chihuahua.—The Apaches.—Special Advantages of Chihuahua, Sonora, and Sinaloa.—Value and Distribution of the Ores.—Means of acquiring the Right to Mines.—Hints to Capitalists.

The object of this present chapter is to give a short description of the mineral resources of Northern Mexico, its past and present state of mining, the cause of its decay, and its future prospects. If it prove of service to those Californians who take an interest in the mines of that part of the world, the writer, for many years engaged in mining pursuits there, will be amply repaid for his trouble.

Mexico is well known as a rich mineral country, having contributed a large share to the circulating medium of the world's commerce, and, so far from its mineral wealth being exhausted, it may be considered as almost virgin yet. The matrix of all this wealth is to be found in the Mexican Cordilleras and their branches, which run more or less parallel with the Pacific coast.

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[*] For this and the following chapter I am indebted to A. W. C. Brawne, Esq., an English gentleman resident in Sonora, a most intelligent and reliable authority, to whom I return my thanks for these notes.—S. M.

That part of the Cordilleras which is of more immediate interest, and which forms, as it were, the natural boundary between the states of Chihuahua and Durango on the west, and of Sonora and Sinaloa on the east, is called the *Sierra Madre*, or "Mother Mountains," branches of which diverge into the four mentioned states in all directions, being, however, of more alpine a character only in those states which border on the Pacific Ocean. These Mother Mountains and their principal branches are, indeed, most prolific in all the precious minerals; so much so, that it may be safely asserted there is hardly a village district or grazing estate in these mountain regions but can show some vein of gold, silver, lead, or copper, while many of the rivers and creeks of the glens and valleys contain placer gold in more or less abundance. But it must not be inferred from this that all these veins are being worked, or that the country has been fully explored, for nothing would be farther from the truth; probably not one fourth of the existing metallic wealth is known, while but a moiety of it has been or is being developed.

During the Spanish reign mining was far more extensively prosecuted than since the independence of Mexico, which is testified by numberless old abandoned mines, here called *antiguas*, or ancient, and by the diminished annual production of gold, silver, and copper. Under the Spanish government, which did its utmost to foster this important branch of industry, the miners had many privileges and great advantages; they had peace and security; mineral aviadores, or providers of goods and provisions, which they obtained on credit; government commissaries, who furnished them with quicksilver at low rates; abundance of good labor at merely nominal wages; and any amount of cheap cattle, horses, and mules. This enabled them to successfully work with a small capital many mines, which under the present circumstances would prove but losing investments to small capitalists. Although the Spaniards prosecuted their mining operations more extensively, and with greater industry, perseverance, and success, it is not evident that they possessed a greater amount of mineralogical knowledge than the Mexicans of the present day. Indeed, numerous ancient surface excavations of veins, without any shafts and drifts, still show that many of the former dedicated themselves only to that easy mode of surface working which most readily furnished them payable ores, and abandoned the veins for new ones as soon as the raising of the ores became more difficult, or the latter diminished in their intrinsic value. Nevertheless, many of the best preserved mines, which date from that time, will favorably compare with those of modern development.

At the present time, when mining has reached its lowest ebb in Northern Mexico, there are but few mines which create special comment; hence the erroneous opinion of many travelers, who pay flying visits to that part of the world, that the mines of Alamos, Cedros, San Xavier, San Antonio de la Huerta, and Babicanora, in the State of Sonora; those of Rosario, in Sinaloa, and those of Guadalupe Calvo, Cerro Cahui, Batopilas, Vasaparas, and Palmarejo, in the State of Chihuahua, are the only ones of merit. Without detracting from the value of these really good mines, it may be safely asserted that there are many hundreds of veins worked in a quiet, unostentatious, and often shiftless manner, which lose nothing by comparison, while a good many far excel them in the intrinsic value of their ores. But, generally, the mines of this part of Mexico are worked in a manner which, though it may satisfy their unambitious owners, can never fairly develop their inherent wealth, and which often causes their total abandonment. There is but little capital invested in most of these enterprises, little or no expeditious and labor-saving machinery used, and but a small number of operatives employed; consequently, no equable and grand results can be expected. As a general rule, metallic veins do not contain in all their parts the same intrinsic value of ore: in different stretches there will be poor, fair, good, and exceedingly rich ores; it follows, then, that in working a vein only in a few isolated spots—as is necessarily the case where the want of capital prevents the occupation of many operatives, and the subsequent opening of many shafts and drifts—the miner takes his chance of luck; he is generally content if he manages to pay his way along while the ores are poor; to lay by a little for the day when a "horse" or cut makes its appearance in the vein, confident that sooner or later he may strike a rich stretch of ore, and rise in a few weeks or months to be a man of more or less fortune. These stretches of very rich ore are at uncertain distances, and of more or less extent, sometimes lasting for weeks, months, and even years. When a mine is worked on a large scale, the enterprise is less exposed to extremes; for from the many different parts of the vein there is constantly ore of all classes raised, and the poor, good, and rich ores furnish in the aggregate a certain average, and insure an equable and constantly profitable return. Most of the Mexican mines, if worked on a large scale, would yield revenues that would make a bank director's mouth water.

In speaking of mines, a word of miners is not amiss: There is a numerous body of poor Mexican miners, the "gambussinos," who, though originally a very deserving class of people, have done much harm to the mining interest, and, although their ill-directed industry has contributed momentarily to augment the productiveness of mining, and, indeed, has solely sustained many mining towns, they have nevertheless proved themselves a bane to the country. (Those petty miners who dedicate themselves to the working of "placers" are not included in this denunciation of gambussinos, albeit they bear the same appellation.)

In former times, before the devastating incursions of the Apache Indians, the gambussinos occupied themselves in prospecting and discovering mineral veins, which they generally sold to persons of capital; they also personally raised and reduced ore in sufficient quantity for their independent subsistence; and as they were a numerous body, the small portions of gold and silver annually produced by each individual formed quite a large aggregate. But when the hostilities of the Apaches rendered it unsafe for single individuals to traverse the country in all directions, many of them betook themselves in bodies to work in such mines as had been abandoned by their former owners. This would have been of great benefit if they had formed an association under the direction of one or more of their number, instead of which they only congregated together for the sake of mutual protection, while each individual did as he pleased. Working without order and foresight, and without those salutary checks on their operations which were interposed by the mining inspectors in former times, they break out ore only where most handy and rich; and, to save time and labor, they throw the poor ores and rubbish into those shafts and drifts that are of no immediate interest to them, and thus render them soon impassable. When the ores turn poor in the unobstructed shafts, they, perhaps, regret to have cut off the access to those in other parts of the vein; but as it is too troublesome and costly to reopen them, they commence to diminish the size of the ore-pillars, and frequently extract some of them altogether. The vein walls, losing their required support, begin to crack, and Nature generally settles the business with a great crash. Never mind, there are other abandoned mines at hand, to which they betake themselves, to play the same game over again, with generally the same results; so that, when a mine has once been fairly squatted upon by these would-be miners, it is sure to be more or less spoiled, and requires often a large expenditure of labor and capital to reopen.

A good deal of the decay of the mining interest is to be attributed to the miners personally. Many persons engaged in mining enterprises without the requisite knowledge and capital to insure success, very often involved themselves in debts, which as often they were unable to pay; their failure created distrust, and caused all that credit, which formerly was given by the merchants most liberally, gradually to disappear, much to the detriment of the mining industry of the country. Until experience had taught them better, the majority of Mexican miners, servants as well as masters, were of the most spendthrift, gambling disposition. Almost all the Spaniards who worked mines in Mexico were so successful, and realized fortunes so easily and rapidly, that most of their Mexican successors thought their fortunes assured by merely being the owners of mines, altogether forgetting that it was also indispensable to personally look after their business, and to practice prudence and economy. Their lavish, gambling mode of life, their negligence and laziness, no mine in the world was rich enough to sustain; consequently, when a *borasca** made its appearance, as it will in every mine once in a while, they not only found themselves without the means of indulging farther in vice and extravagance, but not unfrequently without the requisite funds to enable them to pierce through the poor ores and dead rock in order to strike the rich ores again. Credit, under such circumstances, they could not obtain, for who would trust a gambling spendthrift? consequently, they were obliged to sell or abandon mines that had produced hundreds of thousands, and even millions. Their successors no sooner struck a *bonanza* than, either from inclination or seduced by others, they commenced to enjoy life in pretty much the same manner, which, with but few exceptions, ended in like results. "Like master, like man:" the overseers and servants, finding the business left entirely in their own hands, soon began to think that a few pounds of ore—every day more or less—would make no difference and never be missed; and, being excellent judges of ore, they always selected the very richest for themselves—ore so rich that a few pounds of it often enabled them to imitate their master's carousing and gambling on a small scale. Is it to be wondered at that, under such circumstances, the pursuit of mining should have decayed gradually?

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* *Borasca* is a temporary failure of the vein or of rich metal. It is the antithesis of *bonanza*, which signifies a rich and extensive deposit of metal in the vein.

However, gambussinos and miners are not alone to blame; for many are the causes of the decay of mining in Northern Mexico, and they all emanate more or less directly from the overthrow of the Spanish domination. The first suicidal act of the Mexican government was the expulsion of the Spanish from the country, which gave a fatal blow to the mining interest by abstracting from it almost all the capital and well-directed industry which, until then, had sustained it in splendor, and caused the suspension and abandonment of many mining operations. The establishment of the republican form of government did not prove a panacea for all the evils the Mexicans were suffering from, and led to continual revolutions; the government, always more or less in need of the military forces to quell rebellions in the capital and the principal cities of the interior of the republic, which are the hotbeds of revolutions, was compelled to greatly reduce, and finally, from the empty state of the treasury, altogether withdraw the troops from the northern frontier states, where, until then, they had afforded protection against the daily increasing hostilities of the Apaches. In consequence, all the more immediately exposed mines, hamlets, and ranches in the states of Chihuahua and Sonora were gradually abandoned, as few of them employed a sufficient number of people to afford a self-sustaining protection. Prior to this, however, many mines had already been abandoned in Sonora, in consequence of the uprising of the Opata and Yaqui Indians, who were living in the eastern and southern part of the state, which caused a sanguinary struggle of some duration. Many mines were also deserted in consequence of the rebellions of the Papago and Seri Indians; and although all these half-civilized tribes were re-subjugated, many mines remained in an abandoned state, or were squatted upon by gambussinos.

A great many mines, although not situated so near to the habitats of the savages as to render a residence insecure to life, are in districts devoid of arable lands and deficient in water power: the reduction of their ores by the amalgamation process, the principal manipulations of which were effected by horse or mule power, required a constant supply of well-conditioned animals; but when it became impossible to securely keep these in the natural pastures of the country, and their maintenance in stables proved too costly on account of the difficulties of transit and the consequent high price of provender, many of these mines were gradually abandoned by their owners, to whom the application of steam power was either unknown, or, for want of capital, impossible.

Many mines, again, have been abandoned when the first stretch of poor ore, or a cut in the vein, appeared, owing to the want of perseverance and means, or the ignorance and apathy of their owners; while others were left on account of the abundance of inherent water, for the extraction of which the here known applications of windlasses, wims, and drain-tunnels were either found insufficient or inapplicable. Others, again, were deserted on account of suffocation, and a great number because the ores were too rebellious to yield to the simple modes of reduction known to their ignorant owners. Not unfrequently the owners, before abandoning their mines, would break out the ore pillars, thereby rendering the reopening of them by others more difficult and expensive.

All these outward pressures have necessarily operated most injuriously on the mining interest of the country, which, in spite of the immense natural mineral wealth of the country, has been decaying. To look for an improvement of this state of things to the Mexicans alone seems hopeless indeed. They possess their virtues, but a want of enterprise, of mutual confidence and spirit of association, of industry and perseverance, which characterizes them, is not likely to lift them out of their present despondency, and to effect the regeneration of their superb country.

A foreign element is now required to revive mining in that part of Mexico, and to restore it to its pristine splendor and productiveness. Several enterprises, undertaken of late by foreigners, invite imitation, and give cheering hopes that mining will once more become the mainstay of the country. Such mines as the Sierra Madre presents *must and will be worked* as soon as they become known abroad. It was but recently stated by Sir Roderick Murchison, the eminent geologist (communicating to the Royal Geographical Society the results of the travels of Charles Savin, Esq., who, accompanied by an assayer and practical Cornish miner, had lately visited the Sierra Madre), "*that, with foreign capital and perseverance, almost all the mines and veins of that part of Mexico would yield good results;*" and the dividends that several foreign companies have been lately paying incontestably show that, with proper management, mining investments in that country are not only safe, but highly remunerative. Since the discovery of the Washoe silver mines, a great spirit of enterprise has been manifested by Californians to make investments of this class; but as they can not all be accommodated near home, it is most proper to direct them to Northern Mexico, than which no country can hold out greater inducements. The field for mining enterprises here is immense; for, not to mention the infinitude of undeveloped veins, the mines, with but few exceptions, may be considered as virgin yet; for works to the depth of 100 yards or so are but surface works, and offer for centuries yet to come profitable employment to people that may be counted by millions. But it must not be inferred that Northern Mexico is an *immediate* field for poor miners, although the day is probably not far distant when even such may find it to their advantage to transplant themselves to that country.

"To work a mine requires another mine," is an old Spanish saying, which, like most proverbs, contains a truth; and although there are many mines in Northern Mexico which, worked even on a moderate scale, may and do pay well enough, yet, to insure equable and constantly profitable returns, it can not be repeated too often, necessitates the investment of large capitals. The inducements to mining enterprises in that country, it has been said already, are very great, and can not fail to attract foreign capital when they become more known, and when the objection generally raised, "the unsettled state of political affairs," is properly understood.

The frequent revolutions, changes of government, and civil wars, which have characterized the Mexican republic for the last forty years, have made themselves felt in the frontier states of Chihuahua and Sonora disastrously only in so far as they caused these states to be left without sufficient military protection against the hostile Apaches; otherwise they have not suffered from the "legerdemains" of the ambitious political and military chiefs who so frequently usurped the supreme power of the republic. In fact, these two states are virtually almost independent from Mexico, and their inhabitants trouble themselves very little about what is going on in the centre of the republic.

The State of Chihuahua has also been singularly exempt from state rebellions and intestine wars; and although there have been "pronunciamentos" which caused sudden changes in her government, still the people always had the good sense to steer clear of such revolutions as would cause stagnation of trade and lead to bloodshed. In the sanguinary war which has afflicted Mexico during the last five years, and which has struck at the root of all revolutions to render them difficult for the future, Chihuahua has escaped almost entirely. Of late years the Chihuahuenses have done much toward the progress of their very fine state; and if there be any body of Mexicans who show themselves superior to fate, and may, without much foreign help, rebuild their fallen fortunes, they are surely in the State of Chihuahua, although the general poverty of the people may render it a very slow process. It has already been said that this state, with the rest of Northern Mexico, has suffered greatly from the devastations of the Apaches; and although the agricultural and bucolic interests suffered most, and the great number of magnificent grazing estates have been more or less ruined, the people have of late years persecuted the savages so perseveringly and successfully that the latter have withdrawn, and confined their marauding expeditions to Sonora, Arizona, and New Mexico. It is now very rarely indeed that Apache depredations are heard of in Chihuahua, and consequently many deserted hamlets and estates have been and are being reoccupied.

The State of Sonora has suffered more, having had several intestine wars, occasional rebellions of the half-civilized Indian tribes that inhabit it, and being still overrun by the Apaches. The greater part of the Sierra Madre portion of Sonora has, however, by means of its natural inaccessible character, been exempt from the hostilities of the Apaches, and has also escaped from the direct results of civil wars. As the Indians have always been worsted in Sonora, and the people, Creoles as well as aboriginals, are heartily sick and tired of revolutions, it is to be hoped, and indeed most probable, that in future the energies of the people will be directed into more productive channels, and that the present reign of peace will be durable, and conducive to the prosperity of this naturally rich state.

The inducements to mining enterprises, which are applicable to all parts of Chihuahua, Sonora, and Sinaloa, are, good mines, liberal mining laws, cheap labor, and a fine, salubrious climate; to which may be added the favorable disposition of the governors of these states, who are anxious to attract foreign capitalists to their country, and will concede to such as many privileges as can reasonably be looked for. The good sense of the different state governments, political parties, and even half-civilized Indian tribes, in drawing a distinction between natives and foreigners, and not troubling the latter while they keep aloof from the political quarrels of the former, is most praiseworthy, and affords a greater security than the best written laws alone could guarantee to foreign residents. In all other respects the inducements differ with the nature of the respective veins and their localities. While those mines and veins which are situated in the lower branches of the Mother Mountains, and isolated mountain ranges of Sonora, are in general nearer to shipping ports, easier of access, and frequently admit of wagon transportation, and while most of them are nearer to the agricultural districts, and can obtain the necessaries of life more readily and much cheaper, they are generally entirely deficient in water power and suitable timber for building purposes and machinery, and, with the exception of those of Alamos, more or less exposed to the depredations and hostilities of the Apaches. Those mines of Sonora and Chihuahua which are situated in the Sierra Madre have the inestimable advantages of abundance of water and frequent possible application of water power, any amount of pine and oak timber, pasture in abundance the year round, and natural defenses that in themselves have proved a barrier against revolutionary bands, and in most parts, also, against the incursions of the Apaches; but they admit no transportation except on mule-back, and are more distant from the salt mines and agricultural districts than those of the lowlands. Some parts of the Mother Mountains of Chihuahua, however, are close to an extensive agricultural district, where produce may be obtained for next to nothing. As regards the agricultural and pastoral resources of the here mentioned states, they are quite sufficient for the demand that can ever be made upon them, for they admit of great extension, if such should become necessary in the course of time.

The value of the auriferous ores of that section of Mexico varies as much as in the quartz mines of California, while the capricious dissemination of gold through its gangue renders the working of quartz in the former country as precarious as in the latter. But veins of silver ore are not capricious, and may be worked for centuries with a sure prospect of a constant yield. In regard to the richness and value of the argentiferous ores, they differ, of course, in different veins. It has been asserted, however, by most intelligent and practical foreign miners, personally well acquainted with Washoe and Northern Mexico, "*that, as a general rule, the mines and veins of the latter greatly surpass those of the former, and, taking every thing else into consideration, the inducements are much in favor of the Sierra Madre of Mexico.*" There is an indefinite quantity of mines, the ores of which pay from $50 to $300 per ton; and this asserted estimate is not based on those worthless tests, "assays of isolated pieces of rock," but founded on the known proceeds which the reduced ores of the mines have yielded for years. In rich stretches of the vein, and when the latter is in "bonanza," the ores of many mines have frequently yielded thousands of dollars per ton.

There still remains to consider the acquisition of mines and veins, on which a word of advice may not be amiss. In a country like Northern Mexico, groaning under the weight of its metallic wealth, and abounding in mines more or less developed, there would appear to be no difficulty about their acquisition. But to secure a valuable mine, and at the same time to make a good investment, requires more than the mere possession of a long purse: it requires experience in mining matters, and necessitates an intimate acquaintance with the country and the character of the people.

As it is desirable that in the investments of foreign capital there should be no error committed at the outset, than which nothing would retard the progress of this new mining field more, all persons new to the country had better leave all abandoned mines alone, unless directed to them by persons long resident in the country, whose character and veracity are undoubted, and who, after the investigation of all the facts, current accounts, and traditions, have full confidence in some abandoned mine or other. There are, undoubtedly, many abandoned mines that are well worthy of attention and outlay of capital; but strangers are not likely to know at once which of the many deserted mines it will be prudent to meddle with. Under the present state of things, the safest investments for new-comers will be those mines that have *bona fide* owners; for, as long as a mine can be advantageously worked, *according to the custom of the country*, it is hardly ever abandoned altogether.

But it must not be imagined that such mines can be obtained for a mere trifle; for their owners are fully alive to the value of their possessions, and as they are already in a more or less independent position, and always in expectation of a sudden fortune, they are not anxious to sell, unless induced by a fair offer. There any many native miners of small means willing to cede part of their mines on condition that a certain amount of capital be invested to promote extensive and more profitable operations; but, unless the owners of mines be foreigners, it is not advisable to enter into such arrangements. Far better to give a long price for the absolute ownership of a mine at once.

If foreign capitalists desire to make investments in Mexican mines, it is necessary that they are liberally inclined; if so, there are undoubtedly proper persons to be found who will help them to good abandoned mines, and many owners will be found willing to sell their mines. Moneyed Californians may soon find out that there are mines in Northern Mexico which will well repay the reposed trust, and content any reasonable man.

CHAPTER VIII.

THE MINES OF JESUS MARIA AND SAN JOSÉ.*

Condition of Mining in Mexico.—Wealth of the old Spanish Miners. —The Faults of their Successors.—A European Superintendent of the Jesus Maria Mines.—M. Augustus Remuley.—Abandonment of the Mines.—Recent Movements.—Present Prospects.—The Mines near Jesus Maria and José.—Nuestra Señora del Rayo.—Santa Margarita.—San José del Rosario.—Candelaria.—San Rafael.—Hacienda Quintana.—General Notes.

As you are personally acquainted with the mining district of "Jesus Maria," you will be able to give much valuable information on that head; and, besides, I think that the mining region of the "Sierra Madre" is sufficiently famed to be known in the United States and in Europe. Yet, what must strike persons not personally acquainted with Mexico most, and requires explanation, is the fact that there are so many good mines in an abandoned state, and that many of those that are known to be of inherent richness and steadily worked, do so seldom enrich their owners. You and I, and many hundred others of foreign residents in this country, know the reason of this; but persons abroad can hardly imagine that in a country like this, famed for its mineral wealth, there should be so little theoretical and practical knowledge of mining—of labor-saving machinery—of practical application of scientific inventions—that, in short, every thing should be managed in pretty much the same style as a century ago. Want of enterprise, or of capital in enterprising men; want of mutual confidence and consideration; want of security in many localities on one hand, and an almost total want of industry and perseverance, of prudence, forethought, and economy on the other, are among the principal reasons of the decay into which this most important pursuit has fallen of late.

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* Notes on the Mineral of Jesus Maria y José, etc., by A. W. C. Brawes, Esq.

The many millions of gold and silver yearly exported from this republic attest the abundance and richness of the Mexican mines; yet this product, as you well know, is as nothing to what they might produce under a different state of things. Almost all the old Spaniards who worked mines in this country after the discovery of its mineral wealth realized fortunes so rapidly and easily that their successors thought their fortunes assured by merely being the owners of mines, altogether forgetting that it was also indispensable to personally look after their business, and to practice economy and prudence. Their riotous mode of life, their laziness and negligence, no mine in the world was rich enough to sustain, and, consequently, when a "borasca" made its appearance, as it will in every mine once in a while, they not only found themselves without the means of indulging in farther luxury and extravagance, but also without the necessary funds to pierce through the "poor ores" and dead rock in order to strike the "rich ores" again. Credit under such circumstances they could not obtain—for who would trust a gambling spendthrift?—consequently, were obliged to sell or abandon mines that had produced millions. Their successors, no sooner did they strike a "bonanza" than, either by inclination or seduced by others, they commenced to enjoy life in pretty much the same manner, which, with very few exceptions, ended in like results. "Like master, like man;" the overseers and servants, finding the business left entirely in their own hands, soon began to think that a few pounds of ore every day, more or less, made no difference to their masters, and would never be missed; and, being excellent judges of ore, they always selected the very richest for themselves—ore so rich that a few pounds of it often enabled them to imitate their master's gambling and carousing on a small scale. Yet this working of mines, and living in great profusion and pleasurable excitement, in the hope of a speedy fortune, was too good to be monopolized by Mexicans alone.

The fame of the rich mines had spread to Europe, and induced men of capital to come out or to send representatives. The example of one foreigner, whose name it would be cruel to mention, will exemplify the case of many of his class who sunk fortunes in this manner. He had been sent out by a joint stock company to inspect the mines and veins of "Jesus Maria," and to invest a considerable capital in some of them, with a view of realizing fifty per cent. per annum on it. Furnished with plenty of introductory letters, he no sooner made his appearance at this mining town than its *élite*, rejoiced to see a new face, overwhelmed him with profuse hospitalities, shortening the nights, and many of the days too, with the excitement of gambling and all sorts of debauchery. Pleased and gratified by this warm reception in a strange land, he deemed himself in honor bound to show his appreciation by a return of similar hospitalities; and thus dinners, balls, picnics, shooting and fishing parties, with bands of music hired for the nonce at a couple of hundred dollars, and Champagne at fifty dollars a basket, not to mention the other questionable inventions for killing time, was the order of the day for six months in succession. Being far removed from Europe, it took a long time to correspond; but at last answers arrived from home to letters which he had dispatched after his arrival (and which had been filled with glowing accounts of the wealth of the "Jesus Maria mines" and their owners), express-ing the hope of soon hearing the result of his investments. Brought to his senses, and overcome with shame at having squandered nearly half of the capital intrusted to his care, he bethought himself of some profitable investment, and of eschewing his riotous friends. Having purchased a good but neglected mine, which required the construction of a drain-tunnel, and other expensive works, to be re-opened, he went to work in earnest, and soon expended the remaining capital in the prosecution of these works, without, however, completing them. After he had duly notified his constituents at home that, in order to complete the commenced works and to work the mine, another large sum would have to be remitted to him, he was startled with the orders of the shareholders to abandon an enterprise that, from the large outlays already made without any tangible results and proofs, promised to be a most unprofitable investment. Disgusted, he left for parts unknown, a victim to the reckless life in a Mexican mining town; and since that time foreign capitalists have been shy of Jesus Maria mining investments. Yet, had he strictly attended to his business, and invested the subscribed capital entirely in the enterprise, there is no doubt that good results would have crowned the undertaking.

It is but just to give another example attesting the richness of a "Jesus Maria" mine—that of Mr. Augustin Remuley, a poor French gentleman, who, in order to better his fortune, had been induced to accept the situation of administrador of the mine of "Santa Juliana," with an annual salary of $480, his board and lodging, and three per cent. of the net profits of the mine. He realised in one year $37,000 of his own, while the fortunate owners of this celebrated mine shortly after became bankrupt, with a deficit of nearly half a million of dollars, likewise victims of extravagance and gambling.

Is it to be wondered at that, under such a *régimé*, the pursuit of mining should gradually have fallen into decay and general disrepute, and that this most important branch of industry should have been languishing of late years for want of capital, of credit, and of confidence in it, when the apathy and demoralization of the people have had the tendency to cause a general retrogression and gradual impoverishment of the whole country? For the last few years the mines of "Jesus Maria," like many of those of other localities, have either been wholly abandoned, or been worked by gambussinos alone, which latter people soon render a mine unworkable, and cause its total abandonment. A foreign element is now required to revive mining in this country, and to restore it to its former pristine splendor and productiveness. Several enterprises, undertaken of late by foreigners, give cheering hopes, and invite imitation, that mining will soon be restored, and become again the mainstay of the country. Since the discovery of the silver mines at Washoe, Nevada Territory, United States, the American capitalists have become better acquainted with the profitableness of mining investments, and a very great spirit of mining enterprise is now manifested by Californians to make investments in this country. Purchases of mines have been effected in this and the neighboring state of Sinaloa at very high figures, and other conditional purchases have been made by speculators, while each vessel of late arrived from San Francisco has brought its mining prospectors in great force, so that the regeneration of this section of the country seems to be near at hand.

I have been thus prolix on this head, because I think it necessary to the object you have in view to show the real causes of the many disastrous results of mining investments in this country, and to disabuse the public mind abroad of the too often predisposed unfavorable opinion of the Mexican mines. It was but recently stated by Sir

Roderick Murchison, the eminent president of the Royal Geographical Society, communicating to the R. G. Society the results of the travels of Mr. Charles Savin, F.R.G.S. (who, accompanied by an assayer and practical Cornish miner, had visited the Sierra Madre in Sinaloa and Chihuahua), "that, with British capital and perseverance, almost all the mines and veins of this part of the world would yield good returns;" and the dividends that several foreign companies in this republic have of late been paying incontestably show that, with proper management, investments in the mines of this country are not only safe, but also highly remunerative. And it should also be borne in mind that the mines, with but few exceptions, may be said to be virgin yet; for works to the depth of a hundred yards or so are but surface works, and offer, for centuries yet to come, profitable employment to people that may be counted by millions.

I now proceed to give a detailed description of the different mines, and the ore-reducing establishment, owned by Messrs. Gutierrez, Andreo, and Brawns, in the immediate neighborhood of the mining town of Jesus Maria and José, in the State of Chihuahua, Republic of Mexico.*

I. *Nuestra Señora del Rayo.*—This mine was discovered shortly after the discovery of the mine of "Jesus Maria," from which the mining town obtained its name, in the year 1823, and is situated in the western range of mountains of the Creek (arroyo) of Jesus Maria, at a distance of about half a mile from the town. The "Rayo" was discovered at the same time as the celebrated "Santa Juliana" Mine, from which it is about 500 varas distant. Its first owners were Messrs. Thomas Suza and Thomas Rivera, who worked it successfully, with good results in gold and silver, according to the accounts of trustworthy persons still living at Jesus Maria, and abandoned it on the discovery of the "bonanza" (extremely rich ores) in the "Santa Juliana" Mine, of which they were part owners. This happened in the year 1826. Afterward Messrs. Siqueiros Brothers worked the mine, but abandoned it later on account of suffocation, caused by their having worked the shafts and drifts in a very narrow and disorderly style. For about twenty-five years the "Rayo" remained abandoned, being only occasionally worked by "gambussinos." These are poor, petty miners, who work without license and without order; break out ore here and there, wherever most handy and easy, and, to save labor and time (they doing all the work personally), generally throw the offal ores and dead rock in the shafts and drifts not occupied by them; so that, when a mine once is squatted upon by these petty miners, it is sure soon to be rendered unfit for working, requiring a large expenditure of labor and money to reopen it. In consequence, they soon brought the mine into an unworkable state, and were compelled to abandon it.

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* These notes are introduced as the most extended and accurate in reference to the Sierra Madre mines, the characteristic being the same in Sonora and Chihuahua.—S. M.

In the year 1850, Mr. J. C. Henriquez, knowing the mine to have been left in good ores, "denounced" it with a view to its restoration and possession, and at the present moment (month of May, 1861) the entire mine is cleaned and restored. In this undertaking over $5000 have been expended. Since, the mine has been purchased by Mr. Ramon Andreu; he is occupying twenty miners per day, although there is room and occasion to occupy from 140 to 150 operatives with ease and profit.

The extent of possession of the "Rayo" Mine is 700 varas; the lowest depth as yet reached about seventy varas vertically, the vein having an inclination of from 15° to 20°, and running from east to west. The works of the mine are as follows: above there is a drift-shaft (tajo) forty varas deep, twenty-five varas long, and five varas wide in firm walls, whence two shafts have been sunk, each fifteen varas deep, six varas long, and three and a half varas wide, leaving a pillar fourteen by fifteen varas between. From thence two other shafts of the same dimensions have been sunk, one of which is at present eleven, and the other ten varas deep. The intention is from thence to run a large drift, in order to give more room for operatives to be employed. The vein, in all its parts, in the sides of the drifts and shafts, presents ores of the same class as the accompanying samples. In order to ventilate the mine, it has been necessary to lessen the size of the pillars and to widen the walls, in the doing of which a new vein of auriferous and argentiferous quartz has been met with, of which the sample, marked "El Rayo," is a fair specimen. This vein is of a width of two inches, and about half a vara from the other upper vein, so that all the different veins can be worked together in one and the same shaft. Sample No. 1, marked "Nstra. Sra. del Rayo," is from this upper vein, and likewise two inches thick; No. 2 is from the middle vein, and nine inches thick; No. 3 is from the lower vein, which is from seven to ten inches in thickness. As already said, the uppermost one is divided by dead rock half a vara thick from No. 1, and the dead rock between No. 1 and 2 and between No. 2 and 3 is from four to five inches thick. These four distinct veins are running parallel to each other. It is the general opinion of practical miners that these different veins at a greater depth will unite into one solid body or vein of from sixteen to eighteen inches in thickness. The ley of the ores of No. 1, 2, and 3, according to the last operations made in this last month of May in the common Mexico mode of "beneficio" (reduction), was twenty-four ounces of auriferous silver per mule-load of 300 lbs.=160 ounces per ton of

2000 lbs. The intrinsic value of the silver of the Rayo Mine, according to the statement of the government assayer of the district Rayon, was 11 d. gr. 2 silver, 100 gr. gold, realizing $11 per marc at Jesus Maria prices. The ore, sample marked "El Rayo," discovered in widening the walls, when first discovered at the end of last year, contained more silver than gold, yielding at the rate of $1500 silver and $100 gold per carga of 300 lbs.; afterward it changed more into gold, like the sample marked "El Rayo," of which fourteen pounds produced $800 in gold, which is at the rate of more than $100,000 per ton of 2000 lbs. Later it changed again into its former state, as when first met with, in which it is at the present moment. All the indications are that the present is its normal state, and that more or less rich pockets of gold will be found at uncertain distances. The different ores of the Rayo Mine are docile in their reduction, undergoing the common Spanish amalgamation process. The Rayo Mine offers many advantages: being near the top of a mountain range, from 300 to 400 varas high above the creek, there is no probability of its working being interfered with by water until the level of the creek has been reached, which will necessarily take many years; while in case of suffocation, or for an easier mode of extracting the ores, tunnels could with facility be run into the mountain at a cost of from $5000 to $6000. The entrance of the mine being on an almost perpendicular side of the mountain, slides could easily be erected — timber being abundant, and at three miles' distance from it—so that the ore and dead rock would be placed at the foot of the mountain, alongside of the creek, whence it is hardly half a mile to the hacienda "Quintana."

II. *Santa Margarita.*—This mine is situated at the Rosario, about three miles distant from Jesus Maria, and was formerly worked by Messrs. Gutierrez, Gueroña & Co.

The vein is steep, slanting from one half to one vara wide, its gangue being lime-spath, with virgin gold of 960 m. ley per ton. The accompanying sample ores are fair average ore. The vein runs from east to west, 2° inclined north, and the extent of its possession is eight hundred varas. The mine is at present full of water, on account of the works having been suspended during the last two years, but can be drained with a "malacate" (large windlass and buckets moved by horse power) in about a week, as has been done on several previous occasions, when the working of the mine had been temporarily suspended. Once drained, and working only in daytime, the water which collects during the night is extracted in the morning in the course of an hour or two.

There are three shafts, the deepest seventy-one varas deep, a connection drift of fifteen varas between two of them, and another drift fifty varas long; besides these, an interior drain drift has been commenced, which lacks but from fifteen to twenty varas to reach the surface. This drift is following the course of the vein. The mine drained and in its present state, without commencing the construction of any new shafts and drifts, there is room to employ at once sixteen miners. The best class ore extracted during the week has always paid the current expenses, and frequently more; thus the second class ore and the "brosa" (common ore) may be said to constitute the profit. The common ore (brosa) has always paid half an ounce per load of 300 lbs.=$72 per ton of 2000 lbs.; the second class ore up to three marcs per arroba of 25 lbs.=$25,960 per ton; and the best ore up to eight marcs per 25 lbs. arroba=$71,680 per ton of 2000 lbs., according to the prices obtained for this gold at Jesus Maria, where it sells at from $12 to $14 per ounce, though worth more.

The working of "Santa Margarita" has several times been suspended and recommenced; it was last suspended two years ago. The only cause of these suspensions has been the thieving propensity of the mining population of this country, and the great difficulty of obtaining trustworthy people to oversee the operatives and servants; this cause, which is the most serious drawback to the successful working of very rich veins in this country by small capitalists, would, however, prove no hinderance to a company of large means, that can afford to import men as overseers from abroad, or that, by working on a large scale, can afford to offer such salaries to their employés as would induce young Mexicans of good and respectable character and connections to accept such employ.

The improvements belonging to the "Santa Margarita" Mine consist of one stone building of two rooms and veranda, in order, and close to the entrance of the mine, and a "malacate" (large horse windlass), which, together with its roof and foundation wall, requires some repairs if its use should be continued, though it would be better to substitute a force-pump and steam-engine for the extraction of the ores and water, as the latter, at a greater depth, will undoubtedly increase, the works of the mine being already below the level of the water of the adjoining brook. An outlay of from $4000 to $5000 would place this mine in working condition, if the malacate use should be continued; with force-pump and engine a much larger capital would be required. At a distance of about half a mile from this mine there is a creek that has sufficient water to drive machinery by means of a turbine, if it should be desirable to reduce the ores near to the mine, instead of taking them on mule-back (the only practicable mode of transportation) to Jesus Maria, a distance of three miles. Water, wood, timber, and grass are plentiful and close to the mine; the adjoining and surrounding lands belong to the state, and are open to denouncement, consequently can be easily and cheaply obtained.

III. *San José del Rosario.*—This gold mine is adjoining the Santa Margarita Mine, and by many supposed to be the same vein. The vein is almost perpendicular, and from half to one vara wide. There are several shafts and drifts, the deepest about sixty varas deep, but these are mostly filled up with rubbish, offal ore, dead rock, and rain water. It has two drain tunnels, and admits of the formation of others, the construction of one of which would not exceed the sum of $6000 expenses. The best and second class ore pays a similar ley as that of "Santa Margarita," while the broza (common and inferior ley) pays from three to four dollars per load of 300 lbs., and the "polvillos" (heavy residue of the ground and washed ore) pays six ounces "zaroche," at $6 the ounce, to the twenty-five pound arroba. (Zaroche is the Mexican name for gold of low color, containing silver.) In the deepest shaft silver-bearing ore has already been met with, an indication that this ore, like most of the auriferous ores of this region, will change into silver when a greater depth has been reached. The proceeds of this mine obtained by the first owners were so great, that once one load of three hundred pounds realized $10,000.

The mine, discovered in the beginning of this century, was first worked by Messrs. Zuza and Lumbier; and it is but just to mention that the heaviest capital of the State of Chihuahua, which is that of Mr. José Cordero, son-in-law of the late Mr. Zuza, and which amounts to several millions, owes its origin to this mine. Later, the mine has been worked by Mr. Ferdinand Altario. The principal reasons of its having been abandoned were the diminution of the ley; the depth of the mine, which, although not considerable, proved an impediment to men deficient in all knowledge of useful and scientific contrivances, and far removed from all necessary resources; but principally the discovery of the neighboring "Santa Margarita" vein with its magnificent ores, and the discovery of the "bonanza" (extremely rich ores) in the "Santa Juliana" Mine in 1824 and 1825. Since that time the mine has been occasionally worked by gambussinos, who, according to their lazy and negligent way of working, soon filled up the mine with dead rock, which they were too indolent to carry out. The mine, it is asserted by all who know it, is still in good ore, and can be drained and cleaned with a malacate in the course of a month or two, employing from ten to twelve men; once free and clean, it will admit of a good number of miners being advantageously employed. The extent of possession of San José del Rosario is 800 varas. There are no improvements belonging to the mine; otherwise it possesses the same local advantages as the Santa Margarita Mine. No samples.

IV. *Candelaria.*—This mine is situated about one and a half or two miles from the town of Jesus Maria; the vein is almost perpendicular, and from one to one and a half feet wide. The deepest shaft is about ninety varas. The vein has been steadily and gradually increasing, a sure indication of its present character. The ore is very hard, but docile in the amalgamation process. The lowest yield has never been less than $48 in gold and silver per load of 300 lbs.=$320 per ton of 2000 lbs., though it is generally much more, some ore having assayed as high as $3243 per ton of 2000 lbs. The gold of this mine sells at Jesus Maria at $10 the ounce. The samples of ore marked "Candelaria, Jesus Maria," are good class ore; the others, Nos. 4 and 5, common ore (broza). In the bottom of the mine there is a drift in ore twenty varas long, where twenty-five miners can easily work at one and the same time, thus allowing seventy-five miners to be employed during the twenty-four hours, without opening new shafts and drifts.

Candelaria was last worked by Mr. J. Quintana, who suspended the working of it some years ago while erecting machinery for the reduction of ores. In this he expended his capital, and when ready to recommence operations in the mine, he found that the gambussinos, having undermined the foundation walls of the malacate in order to get at the offal ore of the "terrero," had destroyed the strength and safety of it, and that it consequently was risking the lives of servants and animals to make use of it without rebuilding it. Indeed, shortly after the whole concern came down from the effects of a rain-storm. Being without the necessary resources to defray its reconstruction, and unwilling to involve himself in debt, the mining operations of Candelaria remained suspended, and as Mr. Quintana very shortly after died, the mine was abandoned, and has remained in that state for the last few years, for the want of men of enterprise and capital. The mine, being on the top of a mountain range some four hundred varas high above the creek, has but little inherent water as yet, but is full of rain water; it admits of drain tunnels being made, which may cost from $6000 to $10,000, and requires the reconstruction of a foundation wall for a malacate, which, together with the clearing of the mine, would probably cost some $5000. The possession contains some eight hundred varas.

V. *San Rafael.*—This mine is distant three quarters of a mile from the town of Jesus Maria, and was worked first after its discovery by Messrs. Andrew Reducich and Joseph Lopez until the year 1839, when the working was suspended in consequence of the death of the former. Some years later the mine passed into the possession of Messrs. R. Jaquez, I. Parada, and E. Vidal, who worked it until 1861, when Mr. Ramon Andreu rented the mine for two years; the latter stopped working it on account of some difficulties he had with the owners. The vein is nearly perpendicular, running from south to north, with an inclination of from 15° to 20° east, and is about one and a half feet wide on the average. In the bottom of the lowest shaft, which is about fifty-five to sixty varas deep, two drifts have been commenced; in one of them the vein is scattered, but in the other compact, with very fair indications of its changing into a large vein. Since Mr. Andreu abandoned the working of the mine, the gambussinos have destroyed and filled up with rubbish the shafts from the main entrance to a depth of from twenty to twenty-five varas, where there is the first drift, whence two other shafts of from thirty to thirty-five varas depth, with their respective drifts, have not been touched by the "gambussinos," on account of having filled with rain water shortly after the suspension of the work by Mr. Andreu.

From the entrance of the mine to within five varas of the lowest depth as yet reached, the vein has been more or less scattered, not having any decided compactness; but in the last shaft, sunk from the bottom drift, the vein has become compact. There are no sample ores extant, and can not be obtained without first cleaning the mine; but the gold is soft, and docile in the amalgamation process; the lowest ley has never been less than one marc per load of 300 lbs.; the "polvillos" paying from two to three marcs silver per 25 lbs. arroba, consequently the lowest ley has never been less than $110 per ton of 2000 lbs. at the price of silver at Jesus Maria, and this silver, being auriferous, there realized $16 per marc. The mine "San Rafael" has always paid a profit; it can be drained of the rain water in the Mexican fashion, with common hand-pumps; but if a malacate should be used the shafts would require straightening, as the mine has been worked in the "patio y patillo" fashion. The mine is on the top of the western range of mountains, some four hundred varas high, and admits the construction of drain tunnels, which would have to be somewhere about one hundred and fifty varas in length, and such tunnel in all probability, nay, certainly, would cross other veins running in the same direction, and which, where worked, have given very good results. The extent of possession of "San Rafael" is likewise eight hundred varas.

VI. *Hacienda Quintana.*—This establishment for the reduction and amalgamation of ores is situated in the centre of the mining town Jesus Maria, and consists of three stamps and eight arrastras, all the machinery of which is moved by an overshot wheel thirty-three feet in diameter, and reduces three and a half tons of ore per twenty-four hours. It contains all the required adjuncts, is in good order and in daily use, and is fed by the creek of Jesus Maria, which generally has water enough for the use of machinery in the different establishments ten months in the year, and in many years all the year round.

General Notes.—The mining town of Jesus Maria, situated in the Sierra Madre, at a distance of about 250 miles from the ports of Agiabampo and Guaymas, on the Gulf of California, and about 200 miles from the city of Chihuahua, has never been affected by the several revolutions which have occurred in the states of Chihuahua and Sonora, and which in the former state are of a rather innocent nature; nor is this region exposed to the depredations of the Camanche and Apache Indians, who infest other parts of the two mentioned states; it offers, therefore, by its favored situation in the heart of lofty mountain ranges, security to mining enterprise. The neighborhood of Jesus Maria is famous for the abundance and richness of its metallic veins. Most of them, although they have been more or less worked, may be said to be virgin yet, hardly having been worked to a greater depth than 100 varas at most. The only exception to this is the mine of Santa Juliana, which has been worked to a depth of 400 varas, and been abandoned on account of its abundance of water. Almost all the ores of this region, although in most of them silver forms the principal ingredient, are more or less auriferous, so that its silver commands a higher market value than usual. The ores are likewise docile in their reduction, and undergo the amalgamation process.

The town of Jesus Maria is some 5000 feet above the sea, and enjoys a temperate, delightful, and healthy climate; its population is estimated at 3000. Being not far removed—fifty to a hundred miles—from the different agricultural villages of the district of Concepcion, provisions are much cheaper in this than in most other mining towns, and owing to the abundance of mines formerly extensively worked, there is a numerous body of operatives to facilitate the undertaking of extensive enterprises. Timber and fuel are abundant, and at no great distance from town—the former mostly pine and oak; the creek of Jesus Maria having sufficient water for the use of machinery ten months in the year, and often the whole year round, although all the available spots for the application of water power in the immediate neighborhood are already private property, and built up with haciendas. Some of these, however, could be purchased at reasonable prices, as, for instance, the haciendas "Guadalupe" and "Carmen," both together having nine stamps and twenty arrastras, formerly belonging to Messrs. Lopez and Valois.

Common miners earn $1 per task, working overseers from $10 to $12 per week, and all other servants four reals — two shillings sterling per day — payable half in goods, half in money. Salt is generally worth $12 per fanega of 300 lbs.; quicksilver from $45 to $50 per flask of 75 lbs.; maize, $1 75 to $2 25 the fanega of 220 lbs.; wheat, $3 the fanega; beeves, from $10 to $20 per head, averaging from 350 to 500 lbs. gross weight; grass fodder, 50 cts. per load of 225 lbs. Freight from Agiabampo to Jesus Maria, $12 to $14 per mule-load of 300 lbs. There is an "oficina de quintar" (metal stamp and assay office) established by government at Jesus Maria, where gold and silver receives the stamp of currency. Although for the last years no mine has been *regularly* worked, in this stamp and assay office have been monthly stamped above $11,500 for the last three years, the produce of the work of "gambussinos;" and when it is taken into consideration that at least one third of the gold and silver of the country never receives the stamp, an annual production of $150,000 to $200,000 by petty miners alone should go far to prove the richness of the neglected mines of this district or town of Jesus Maria; for if the worst mining style, or no style at all, can produce such a result, what may not well-directed energy and capital effect in this yet virgin field?

CHAPTER IX.

MINERALOGICAL SKETCH OF ARIZONA.*

Limits of Arizona.—Topography.—Geological Structure.—Character of the Vegetation.—The Plains.—The Table-lands.—Rivers, Fountains, and Wells.—Arable and grazing Land.—Part of the great Mineral Region.—The Heintzelman Mine.—Character of the Ores.—Their Order of Deposit.—Processes of Reduction.—Defects in the Processes.—Wages and other Expenses.—Results, actual and prospective.—The Plain of Arivaca.—Santa Rita Mines.—Cahuabi Mines.—The San Pedro Mines.—Lead Mines.—The Mowry Silver Mines.—Various Mines and Ores.—Plancha de la Plata.—General Conclusions.

ARIZONA proper, or the Gadsden Purchase, is that part of our frontier which has the Rio Grande and the Colorado Rivers for its eastern and western, and the Gila River and Mexican boundary-line for its northern and southern limits. It thus extends over both slopes of the Sierra Madre, which here loses its continuous character, giving rise to almost unconnected mountain groups. It is also traversed from N.W. to S.E. by granitic sierras seldom over seventy to ninety miles in length, and distant from each other from twenty to forty miles. This configuration gives rise to a most remarkable occurrence of parallelism.

The intervals between these ranges are plains, having a gradual descent from the sierras on either side. In the western part of the Territory, where but little rain falls, water-courses are very rare, and the surface of these tracts is almost unbroken; but in the central portion, near the larger mountains, they present the appearance of extensive valleys, and are cut up by river beds and frequent tributary cañons. These plains are all connected, and form members of the immense quaternary deposits, extending from the Gulf of California eastward.

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* *Mineralogical Sketch of the Silver Mines of Arizona*, read before the California Academy of Natural Sciences, August 5, 1861, by R. PUMPELLY, Esq., Metallurgist and Mining Engineer, Graduate of the Mining College at Freiberg, etc., etc. Published in the Proceedings of the Academy, vol. ii., 1862.

The quaternary formation is stratified, and composed of both rounded and angular rocks, with pebbles and sand, the detritus of the neighboring mountains and the underlying formations. A gradual and regular descent of the surface of the whole quaternary area toward the Gulf of California and the Colorado River is perceptible, showing that there has been a gradual elevation extending over a large area, and probably during a long lapse of time. That this upheaval is of very recent date is proven by the presence of existing species of marine shells scattered over the surface.

As I have already said, the majority of the mountain ranges are granitic, but we find in many places, and especially those where the parallelism is disturbed, extensive representations of other formations. Usually, outcroppings of gneiss, micaceous, talcose, and clay slates are observable, underlying the quaternary at the base of the granitic ranges. In many places the plains consist entirely of the detritus of these rocks, showing that they extend from mountain to mountain. Toward the Gulf of California these slates are accompanied by metamorphic limestone, and often appear forming independent ridges, or inclined against the higher granite hills. They form the gold region of Sonora, and are probably of the same age as the similar formations of California, of which, indeed, they seem to be the continuation. We find them rising out of the desert, at intervals, from Sonora to the Gila River and the Colorado, and again underlying the tertiary on the western skirt of the Colorado desert, and at various points in Southern California.

Near the coast, and traversed by the boundary-line, is a very interesting volcanic formation. The country is studded over with volcanic cones, some containing craters; immense streams of lava cross the desert, or cover, as with a mantle, high granite hills.

The next formation of importance is that of the stratified conglomerates. These occur in strata of very variable thickness and texture, but all are composed for the most part of fragments of quartziferous porphyry, cemented by a feldspathic mass, also quartziferous. This formation is traversed by intrusive dikes of a porphyry of a similar character to many of the fragments inclosed in the conglomerates.

There is also a great variety of porphyries, both quartziferous and free from quartz, and these are the rocks which for the most part stand in the closest connection with the veins of the country. Many of these porphyries appear to be the result of metamorphic action in sedimentary rocks, but others have every characteristic of an eruptive origin.

Lastly, dikes of a trachytic porphyry and of a cellular black rock, usually in connection with a reddish wacke and a sandstone, are observable at various points through the country.

Climatic influences have given the country a marked and peculiar character of vegetation. Toward the coast the plains are barren and arid deserts, and the traveler may ride hundreds of miles without seeing other plants than dry and thorny cacti and scattered bushes of grease-wood. The granite mountains bordering these deserts are even more barren. Not a tree, nor even a cactus, can be seen on their sides. They tower high above the plains, great masses of white, reflecting the rays of the sun with dazzling brilliancy. The only water to be found over an area of many thousand miles is at a few points in the mountains, where the rains have collected in natural tanks sufficient to last for a few months. During the rainy season, which often nearly fails, shallow pools are formed in slight depressions on the surface, but a few days' sun is sufficient to exhaust these sources.

Farther from the coast the plains begin to show more vegetation; gradually appear the palo verde, the mesquit, and a greater variety of cacti, and on the hills scattered saguaras (*Cereus giganteus*); until, in the eastern portion of the Papagoria, the country is more thickly covered with a low growth of mesquit and palo verde brush, above which looms a perfect forest of the columnar saguara.

East of the Baboquiveri range the character of the country changes; the plains are cut in the direction of the longer axis by deep valleys, receiving tributary cañons from the mountains on either side, and all that remains to show their original character are the cut-up *mesas* or table-lands, lying between the river and the sierras. These mesas retain, indeed, much of the desert appearance, but they are clothed with bunch and gramma grass, and scattered mesquit bushes. Many of the valleys have an extensive growth of mesquit, and along the river beds in the neighborhood of hidden or running water grow large cottonwood trees, and in some places fine ash timber. On the hill-sides, above the level of the mesas, are scattered the live oak of the country, the trees varying from twelve to twenty-five feet in height, giving the country the appearance of an old orchard. As we ascend the mountains, the oaks are mingled with the cedar, until, at an elevation of about 6000 feet above the level of the sea, the pine region commences.

Owing to the peculiar structure of the river beds, which run through loose quaternary deposits, the water falling during the rainy season soon sinks out of sight and follows its course underground, appearing only where the underlying older formations rise, or where the valley is crossed by a dike, in either case natural dams being formed. These occurrences are sometimes of sufficient extent to form running streams for several miles, although usually either only a spring is formed, or more frequently water is obtained by digging.

These valleys of Central Arizona, as well as the mesas and hill-sides, are covered with an abundant growth of different grasses, forming extensive tracts of grazing country. There are not many localities suitable for cultivation, these being confined to such places as have running water for a considerable distance, which can be conducted in canals for irrigation.

Arizona forms a link in the great chain of mining regions that stretches along the western side of the continent. Though but a small portion of the country has been explored, yet between the Rio Grande and the Colorado numerous districts of great mineral wealth have been discovered, and on some of them more or less labor expended. The Mexicans have, at various times since the middle of the last century, commenced workings on a great number of veins, but, owing to the continued inroads of the Apaches, but little was accomplished by them.

After the conclusion of the Gadsden treaty, Messrs. Poston and Ehrenberg, with a small party, entered the country, and, after prospecting a large number of localities, found the Heintzelman vein. The results of an examination of this proved so satisfactory, that considerable attention was drawn toward that part of New Mexico. Joint-stock companies, with little ready capital and immense expectations, were formed. Speculators bought in stock for ten per cent. of its nominal value, and sold out at from fifty per cent. to ninety per cent. to tradesmen and widows, too poor to meet assessments when means for working were absolutely necessary. Men were put in charge who had never seen a mine, and usually with no professional assistance. The results of enterprises conducted in a similar manner are well known. Between the absence of available funds on the one hand, and of protection to life and property on the other, enterprise was already beginning to stagnate, when the withdrawal of the troops made the abandonment of the country absolutely necessary.

The most important of the mines already known and worked is the Heintzelman, or *Cerro Colorado,* belonging to the Sonora Mining Company. It is situated west of Tubac, about twenty-four miles by road. The vein runs north and south, has a nearly vertical dip, and is inclosed in a brown porphyry, free from quartz, and containing ill-defined crystals of feldspar. The thickness of the lode is from twelve to twenty inches. A vertical main shaft has been commenced, with the expectation of intersecting the vein at a depth of 200 feet, but it is only completed to about 120 feet. This shaft communicates by cross-cuts, at 60 and 100 feet, with two galleries.

The ore is separated by hand into two classes, rendered necessary by the difference in their chemical character and in their richness in silver. The first class consists of the more massive and richer ore, composed of Stromeyerite, tetrahedrite, blende, and galena, with native silver; the gangue is quartz, with some barytes, and the carbonates of magnesia and lime. The blende and galena are so predominant in this class as to render the ore unfit for amalgamation, while the percentage of silver in the Stromeyerite is too great to allow of its being treated profitably in the barrels. This class represents about ten per cent. of the entire amount of ore, and the average of its yield of silver, calculated on the entire amount smelted, is nearly $1000 to the ton of 2000 pounds, while the amount contained is about fifteen per cent. more.

The second class contains the same minerals as the first, but they are more intimately associated with the gangue, which in this class forms the bulk of the ore. The blende and galena have a moderate percentage of silver (thirty to fifty ounces), while the tetrahedrite (*Fahlerz*, or gray copper ore) varies from one to one and a half per cent., and the Stromeyerite is said to rise as high as twenty-six per cent. Chlorobromide of silver and native copper have occurred, and native silver in small flakes is frequent. Two varieties of quartz are found, one in the ordinary glassy form, often comby; and an opaque white variety, very brittle, and associated with the richer minerals. Crystallized specimens are very rare, and of the copper silver glance none have been observed.

I have observed the following well-defined paragenetic successions occurring in cavities:

a. 1, quartz; 2, brown spar; 3, scalenohedral calcite.
b. 1, brown spar; 2, barytes; 3, scalenohedral calcite.
c. 1, quartz; 2, galena; 3, quartz.
d. 1, quartz; 2, blende; 3, calcite.
e. 1, quartz; 2, blende; 3, rhombohedral calcite; 4, native silver; 5, scalenohedral calcite.
f. 1, quartz; 2, brown spar; 3, barytes; 4, native silver.

From this it will appear that the general succession in age is, 1st, quartz; 2d, brown spar; 3d, blende, barytes; 4th, calcite; 5th, native silver; 6th, scalenohedral calcite. From this list the relative ages of blende and barytes do not appear.

Galena, blende, and tetrahedrite are usually closely associated with each other in this ore, while the argentiferous sulphuret of copper is entirely independent of them, but is, at times, mixed with erubescite. Native silver occurs in the common filigree form in cavities in the argentiferous copper glance, and is often observable in minute specks on the tarnished surface of blende and tetrahedrite.

The reduction works are on the Arivaca ranch, eight miles distant from the mine, and connected with it by an excellent road. The process used is the European barrel amalgamation for argentiferous copper ores, and was introduced by Mr. Küstel, a German metallurgist, about three years since. The extent of the works is very small, permitting of the treatment of about one and a half tons a day. Six dry stamps, a steam arrastra, one reverberatory roasting furnace, four barrels, a retort, and one refining furnace, together with a ten-horse power engine, constitute the works.

The second class ore, after being coarse stamped, is removed to the arrastra, which is capable of grinding one ton per day to the necessary fineness. The resulting slime, after drying, is pounded and sifted. Five hundred pounds of the ore, after being mixed with from eight to ten per cent. of salt, are subjected to the chloridizing roasting for about four hours. About one half hour before withdrawing the charge, two per cent. of unburnt limestone is added to reduce the bichloride of copper to protochloride. In this manner, six roastings are made in twenty-four hours. The barrels are charged with 1000 pounds of the roasted ore, 100 pounds metallic copper in metallic balls, and 144 pounds of water. After revolving two hours, to effect the partial reduction of salts injurious to the mercury by the copper, 500 pounds of quicksilver are added.

After revolving twenty-four hours in all, including the second watering to collect the disseminated globules of quicksilver, the whole is withdrawn, and the amalgam separated and retorted. The resulting silver is simply melted in a small reverberatory refining furnace, with the addition of a little borax, and cast in bars of different sizes, having a fineness of 0.990 to 0.998. In the absence of coin, these are used as a circulating medium, and find their way to Sonora, and ultimately to England.

The defects of this process, as applied at Arivaca, are very great, and are attributable in part to the character of the ores and absence of some facilities. The roasting is performed too hurriedly, and the roving character of the Mexicans renders it very difficult to make them good workmen at the furnace, where so delicate a process, requiring long practice, is to be well executed. The percentage of sulphur in the ore subjected to this operation is so very low, that the decomposition of the salt must be imperfect, causing inordinate loss of this material, which is very expensive. Owing to the small amount of lime added during the roasting there can not but be an unnecessarily large loss of quicksilver. The loss of silver is said to be from twenty to thirty per cent., which destroys the main advantage of the European barrel process over the cheaper Mexican amalgamation; but, by more carefully meeting the requirements of the method, this loss could probably be reduced to at least ten per cent. These works were erected for temporary use, and, consequently, the amount of manual labor is more than double that which is necessary.

The workmen at the furnace receive one dollar per day of twelve hours; Mexican laborers twelve to fifteen dollars per month, and to each man a ration of sixteen pounds of flour per week. American laborers are paid from thirty to seventy dollars per month and boarded. The cost of salt which is brought from near the coast, is four cents per pound; of copper, twenty-five cents per pound; and wood, from four to six dollars per cord, delivered at the furnace. The price of quicksilver is one dollar per pound.

The first-class ore was formerly smelted at the mine in Castilian furnaces, with the addition of an ore of sulphide and carbonate of lead, litharge, and iron ore. The loss of silver was from fifteen to twenty per cent., and the cost of extracting that metal about sixty dollars per ton of ore. The yield, as before stated, was nearly $1000 to the ton.

From the results obtained in 1859 on 160 tons of amalgamated ore, it appears that about $24,000 worth of silver was produced. The loss of quicksilver equaled one pound (=one dollar) for every forty dollars of silver extracted. The consumption of copper was 1480 pounds; of salt, 32,000 pounds; and of wood, 360 cords. The production of silver at the Heintzelman Mine is estimated at over $100,000 (not including large amounts of ore stolen and worked in Sonora); but, had it been well and regularly worked, and provided with reduction works of sufficient capacity, it might have produced over $1,000,000 in the same time.

This is the first experiment made in the United States in applying the barrel process to the treatment of argentiferous copper ores, and it is not surprising that, in submitting to it ores of the peculiar character which these possess, and especially when we consider the absence of necessary facilities, we should find in it important defects, many of which are remediable.

No experiments have been made in working this ore by the patio or Spanish-American amalgamation process, so that it is not known to what extent the rejection of the present method would prove advantageous; but the results obtained at Arivaca show conclusively that, by remedying the defects within the limits of possibility, and by proper substitution of mechanical for manual labor, the European method can be used with profit in Arizona for ores of this class, and containing about $150 to the ton. The same may be said of the ores of many other mines which are free from lead, and in which tetrahedrite or copper glance is the principal silver bearer.

Near Arivaca there are said to be twenty-five openings on veins worked formerly for gold and silver. The valley of this ranch is a large plain. The soil rests on clay slate, which is also, in part, covered by a slight deposit of the usual quaternary. The hills bounding the valley on the north and south are of quartziferous porphyry. This is a fine-grained rock, with pink crystals of orthoclase and quartz crystallized in double pyramids. The northern line of contact between the clay slate and porphyry is marked by a bold vein of quartz running east and west. In this are several openings, made previous to the Apache war. The ore which I observed was galena, and its altered products disseminated in quartz. It is said to contain gold. Several quartz veins traversing the porphyry have been worked for gold, as have also the beds of the arroyos in the neighborhood. Arivaca has too little wood for extensive operations. When the Heintzelman Mine is again worked, the reduction should be effected at Tubac, where the erection of large works would be an incentive to the opening of many of the mines in that neighborhood.

Santa Rita.—The mines of the Santa Rita are situated in and around a beautiful valley, about ten miles east of Tubac, and among the foot-hills of the Santa Rita Mountains. The valley and the hills to the north are of a metamorphic quartziferous porphyry, while the hills to the east consist of a feldspathic rock. It is in these two formations that the veins occur. The hills to the south are formed in part by the porphyry conglomerates already mentioned, and in part by a remarkable feldspathic porphyry. This last rock has a compact light gray ground, bearing numerous crystals of a white triclinic feldspar and small prisms of hornblende, but entirely free from quartz. It is apparently older than the conglomerates. In it no veins have been discovered.

The veins in the feldspathic rock are very numerous, and have, with few exceptions, a nearly east and west course. Their dip is nearly vertical, and they vary from ten to twenty-five inches in thickness. The gangue is almost entirely quartz, and the ore generally argentiferous gray copper and galena. When this last mineral is unaccompanied by the tetrahedrite, its yield is rarely over 0.1 per cent. of silver, but when occurring in proximity to that mineral it contains often from 0.5 to 0.75 per cent.

The gray copper ores vary from light steel-gray to tarnished black, and contain from one to over two per cent. of silver. This mineral, when associated with galena in decomposing, is replaced by a porous vitreous substance of yellowish-green color, and consisting principally of antimoniate of lead, containing from one to two per cent. of silver. The "crystal vein" is of a massive ore of galena, with about twenty per cent. of zinc blende and copper pyrites. The gangue is quartz, but no tetrahedrite was observed. This galena is very poor in silver, containing from 0.1 to 0.2 per cent. only. Thus to the presence of tetrahedrite is apparently due the silver of these ores. In this vicinity are several veins of *gossan*, or oxide of iron, the cappings of deposits of ore, and themselves containing a moderate percentage, about 0.1 per cent., of silver.

The wall rock of these veins is a crystalline granular rock, and has a slightly bluish tint on its fresh fracture, while its weathered surface is discolored by oxyd of iron proceeding from the alteration of the little hornblende contained in the rock. It also has a little mica and disseminated particles of magnetic iron. It thus approaches in composition to a dioritic rock.

The veins which occur in the metamorphic porphyry have, so far as opened upon, shown a different character from the above. The porphyry itself has a compact gray ground, impregnated with carbonate of lime, and bearing numerous crystals of opaque, white, triclinic feldspar, grains of quartz and dark gray mica in six-sided plates. It contains also specks of magnetic iron.

Veins in this rock are of quartz, often comby, containing a black tetrahedrite, with from four to eight per cent. of silver, and are in places impregnated with galena in small cubes, which contain 0.5 per cent. of silver. The gangue is discolored by the blue and green carbonates of copper and black manganese, with films of the sulphuret of silver and of native silver. Experiments made on various quantities of these ores in the patio, with the use of salt and mercury, without roasting or magistral, have given an average yield of fifty per cent. of silver, and comparison with correct assays shows that from eighty to eighty-five per cent. of the silver contained can be extracted by the simple action of salt and mercury. This fact would seem to show that the silver of this tetrahedrite is contained as mechanically mixed sulphuret. Some of the veins in this porphyry have been thrown out of position by a large dike of granite.

These mines have been but little worked, although three attempts have been made — twice by the Mexicans and recently by the Santa Rita Company, but in each case the Apaches have forced an abandonment. The ores reduced by the last company were divided by hand separation into two classes. The first, containing tetrahedrite in quartz and brown spar, had an average yield of 176 ounces of silver to the ton. The second class, a quartzy lead ore with little tetrahedrite, averaged eighty-one ounces to the ton.

Cahuabi Mines.—Westward of the Baboquiveri range, on the outskirts of the desert, in a country clothed with only bushy mesquit and cacti, and almost destitute of water, there exists a region which, from the character of its veins, appears to contain greater mineral wealth than any other part of Arizona yet explored. It is situated in the centre of a large plain, forming part of the Papagoria, and about eighty miles by trail northwest of Tubac.

The veins which I observed occur in a quartziferous porphyry and in an amygdaloid rock. This latter has a brown compact base, containing numerous acicular crystals of triclinic feldspar, and calcareous spar in impregnations and small threads. Cavities, some filled with quartz and others with Delessite, are frequent. In this formation is the Cahuabi vein. It is from twelve to fifteen inches thick, and consists of quartz and heavy spar, containing argentiferous copper glance, galena and black tetrahedrite. The ore of this vein is said to average from $150 to $200 per ton.

The *Tajo* vein, about three miles from the Cahuabi, occurs in the same rock, and is about two feet in thickness. The gangue is barytes and quartz. The ore consists of copper glance, galena, and tetrahedrite, with some blende. With the copper glance is associated copper pyrites. This vein contains also considerable metallic gold. The ore is said to vary from $150 to $170 per ton.

Four miles west of the Tajo is a vein which traverses a quartziferous porphyry of the same character as that which bears the gold quartz veins of Arivaca. The gangue is quartz, and contains black tetrahedrite and some vitreous copper.

A great number of veins of quartz and barytes occur in these two formations, the latter seeming to prefer the amygdaloid rock. One vein of barytes, containing a "bonanza" of sulphuret of silver, was found and worked by the Mexicans, and several specimens of heavy spar associated with silver glance from various localities were shown me.

The San Pedro Mines.—These are about thirty-five miles east of Fort Buchanan, and were opened by a St. Louis Company. The ores that I have seen from this locality are tetrahedrite and massive copper glance, containing copper pyrites, with quartz and barytes for gangue from the San Pedro vein, and galena, with iron pyrites, from the St. Paul Mine. These veins were being opened and promising well when the company abandoned them on the account of the assassination of the employés by the peons. The San Pedro River near these mines is said to be capable of furnishing sufficient water power for extensive reduction works.

From a study of the fissure silver veins of Central Arizona it would appear, firstly, that they have in common quartz, galena, and tetrahedrite; secondly, that there is a close connection between barytes and copper glance, more or less argentiferous, in their occurrence in a vein; and, thirdly, that the proportion of silver in the galena is largely increased when this mineral is associated with tetrahedrite. A large number of assays made on the gray copper ores of different mines showed a range of from one to eight and a half per cent. of silver. In many, if not all the richer varieties examined, a large percentage was undoubtedly contained as mechanically mixed sulphuret of silver.

In the Santa Cruz Mountains, south of Fort Buchanan, is a series of lead mines, several of which were excavated by Mexicans several years since. They appear to follow the line of contact between an argillaceous limestone, in which corals have been found, and a probably metamorphic porphyry. In places the deposits are of considerable extent, often many yards in thickness, but, apparently, very irregularly developed. Near the surface the galena is often entirely changed into carbonate of lead associated with porous quartz.

At the *Patagonia Mine** the ore consists of galena sufficiently altered, at the present depth of working, to render its reduction extremely simple. The average yield of silver from this ore has been, thus far, about $80 per ton.

There is another class of contact veins bearing both lead and copper ores. To this class belongs the deposit near San Xavier, on the Santa Cruz. The ore is galena, with copper pyrites and tile ore, associated with oxyd of iron and quartz, the whole interstratified with metamorphic limestone. The galena examined contained 0.20 per cent., the copper pyrites 0.25 per cent., and the tile ore 0.10 per cent. silver.

Near Caborca, in Northwestern Sonora, are deposits of a somewhat similar character. The strata of metamorphic limestone are almost vertical, and near their contact with granite become highly impregnated with lime garnets. Along the line of contact between the two formations, the presence of copper ores is indicated by frequent occurrence of green and blue carbonates and impure red oxyd. These indications often lead to the discovery of limited deposits containing a few hundred tons of copper. One of these, worked in 1861, yielded from 250 to 300 tons of twenty-five per cent. ore. There was no vein; the ore, which was accompanied by calcareous spar, being gradually replaced at the bottom of the deposit by the limestone of the formation. The ore is copper glance, tile ore, or impure red oxyd, and some copper pyrites. Accompanying these deposits, and also where no copper ore is visible, the line of contact is occupied by masses of magnetic iron. Where the same limestone comes in contact with diorite, the former contains large crystals of magnetic iron and spinel.

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* Now the Mowry Silver Mines.

Planchas de la Plata.—In Sonora, just south of the line, and near the meridian of Tubac, are the Planchas de la Plata Mines, still celebrated throughout the republic. According to the best Mexican and Jesuit authorities, large masses of native silver were discovered there in 1769. Pieces of great size were obtained (one is said to have weighed 3600 pounds), and the workings were being prosecuted with vigor and success, when the Spanish government declared the deposit to be a *criadero*, and, as such, to belong to the crown. The place was therefore abandoned, and every attempt made at regular working since the Revolution has been frustrated by the Apaches.

The most singular feature connected with the discovery is that no vein, from which these masses could have come, was found. The deposit seems to have been a regular placer. The silver occurred in pieces of every size down to small grains. Several rich veins were opened in the neighboring mountains, but were also abandoned from absence of protection. The only specimens that I have seen from this locality were apparently a partially decomposed quartziferous porphyry, from the wall rock of the Mina Colorada, and were impregnated with grains of silver glance.

General Conclusions.—Before the working of mines in Arizona can become regular and profitable, many changes will be necessary. The Apaches must either be exterminated or reduced to complete submission, and this can only be accomplished by a long series of campaigns. A port is also necessary, without which all supplies and machinery have to be transported over deserts from the Gulf of Mexico or the Colorado River. Guaymas, 350 miles, and Port Lobos, 150 miles from Tubac, are the natural entrances to the country, and, so long as these remain in the hands of a treacherous and capricious government, no enterprise can flourish either in Arizona or Sonora. Farther, the present unnatural boundary-line will always be a source of trouble, affording a shelter to the robbers and assassins of both countries.

The substitution of white for peon labor would probably be a failure, owing to the debilitating influence which the climate exerts on Northerners. The Mexican labor is good when properly superintended; but, to render it advantageous, the recognition of the traditionary custom of peonage is necessary. A thorough code of mining laws is also much to be desired; for, however well the plan of permitting miners to make their own regulations may be thought to work in gold districts, it will never place silver mining on a solid basis, but can not, on the contrary, act otherwise than prejudicially to the interests of both miners and the state.

There is but little doubt that, after a few years of proper development, Arizona might become an important source of silver, although its veins do not possess the great thickness of many of the mines of Mexico, although the average richness of the ore is greater and more concentrated. Still, it can not be expected to produce the brilliant results obtained in Central Mexico.

CHAPTER X.

CORRESPONDENCE.*

S. Mowry to J. R. Bartlett, Esq.—From J. R. Bartlett, Esq.—From John C. Hays, Esq.—From Hon. Joseph Lane.—From John Nugent, Esq.—From Hon. Miguel A. Otero.—From S. W. Inge, Esq. —From Major C. E. Bennett.—From Sam. F. Butterworth, Esq.

S. Mowry to J. R. Bartlett, Esq.

Washington, September 20, 1857.

My dear Sir,—The general impression which has in some way become diffused that the new Territory of Arizona is a worthless and barren country is so wide from the truth, and is calculated to retard in so great a degree the early development of this valuable region, that any reliable information respecting its mineral and agricultural resources will be read by the public with great interest.

The recent large emigration into the new Territory, the fabulous stories which each California mail brings us of discoveries in silver and copper, the establishment of the Overland Mail route to California throughout its entire length, the petition of its inhabitants for government protection, and the probability of its erection into a separate Territory by the next Congress, all operate to make Arizona a prominent subject of public inquiry. Few persons know better than yourself its resources, both agricultural and mineral. Perhaps no one can furnish such accurate and decided information, especially of that vast agricultural region north of the Gila, which once sustained a mighty population.

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* The following letters from eminent persons, some of them of national reputation, are only a portion of those in my possession, extending over a period of seven years. They are given as additional and unanswerable testimony to the truth of the statements contained in the preceding pages. The concluding letter, from Sam. F. Butterworth, Esq., President of the Quicksilver Mining Company, and late Superintendent of the United States Assay Office at New York, was received after this edition was prepared for the press. The high character of the writer, and his intimate acquaintance with the subject, gives especial weight to his opinion.—S. M.

Your official connection with the Gadsden Purchase as United States Commissioner invests any statement from you in this connection with emphatic authority. I am sure you will at once interest the public, and greatly serve the people of Arizona, by allowing your views, already known to your friends, to be published.

Very respectfully, your friend and servant,

SYLVESTER MOWRY.

Hon. John R. Bartlett, late United States Commissioner.

From J. R. Bartlett, Esq.

Providence, October 31, 1857.

DEAR SIR,—I have received your letter of the 20th ultimo, asking of me certain information relative to the mineral wealth and agricultural resources of the new Territory of Arizona, which is now attracting public attention, with a desire that I will furnish such facts as came under my notice relative to this region while acting as United States Commissioner in the survey of the Mexican boundary.

"The general impression," which, you observe, "has become diffused, that this Territory is a worthless and barren country," is not correct. A large portion of California may be called barren—indeed, the gold-bearing region is in a great measure so—but no one would call it a "worthless" country. Its hills, its elevated lands, and many of its plains, being destitute of water-courses and springs, are of little value for agricultural purposes, while for grazing they are valuable. There are, besides, large districts in California, strictly deserts, which are barren and worthless. Again, the valleys along the rivers and water-courses, as well as those lying between ranges of mountain, and deriving sustenance therefrom, are exceedingly rich, and surpass in fertility any agricultural districts of the Atlantic States. The same rule will apply to the region in question, which is included in the so-called Territory of Arizona.

In replying to your queries, I will extend my observations to the territory embraced in the "Gadsden Purchase," so called, as well as to the district which bounds that territory on the north, particularly the valley of the Gila, and of its principal confluent, the River Salinas, as you make mention of this.

The vast region in question, like California, presents three distinct features in its surface, without speaking of the mountainous district; first, dry plains; second, elevated plateaus or table-lands; and, third, agricultural valleys or bottom lands.

Of the districts embraced in the first division, one lies south of the Gila, between the head waters of the Gulf of California and the valley of the Santa Cruz; the other west of the Rio Grande, at intervals between that and the San Pedro valley. The table-lands lie in the latter district, as well as between the San Pedro and Santa Cruz Rivers. The valleys where there are arable lands are the Rio Grande, the Mimbres, and in the Burro Mountains, El Saux, San Pedro, Calabazas, Santa Cruz, and the Gila. The Rio Grande, San Pedro, and Santa Cruz are the larger; the others, though small, could be rendered highly productive, and would be brought into use in settling the Territory. In speaking of arable lands, it is necessary to remark that artificial irrigation is necessary for all agriculture throughout New Mexico, much of Texas, and the whole of Northern Mexico. The yield in this case is vastly greater than is produced in countries where the sole dependence is upon the rains.

The dry plains are generally level, with a hard surface, and are admirably adapted for the purposes of a wagon road or railway. Experience has shown, too, that, with artesian wells, water may be obtained. By mere digging I found it in many places where certain indications well known to experienced eyes may always detect its existence. Whether these arid spots can ever be rendered available for agricultural purposes I will not pretend to say. My opinion is that they can not.

The table-lands are covered with a short and luxuriant grass, upon which immense herds of cattle have been and may still be raised. Formerly herds of forty thousand existed in Chihuahua, which then included the eastern portion of Arizona. On the haciendas where there were no ponds or streams the cattle obtained their water from the "pozos," or simple wells, and the "norias," or draw-wells, where the water was drawn up by a wheel worked by mules. These peculiar wells are found throughout Chihuahua, Durango, and other states, and furnish a sufficient supply of water for haciendas with large droves of cattle. I met with many of these wells far from any streams.

In the northern parts of Chihuahua, or Arizona, the cattle herds have long since disappeared, owing to the incursions of the Apaches and Camanches; and I may make the same remark with regard to that portion of the Territory of Arizona which formerly belonged to Sonora. The great herds have disappeared, and the haciendas are every where in ruin.

In the grazing district I ought also to include many of the mountain valleys and ravines, as well as the lesser hills, where gramma grass (*crondosium*) is found in abundance, and which is greedily eaten by horses, mules, sheep, and horned cattle. This grass is very nutritious, and even when dry and parched by the intense heat of summer is eagerly sought after by animals.

The great plateau west of the Rio Grande, where grass exists, and which may embrace two thirds or more of the elevated region, consists of an undulating prairie, with here and there a conical-shaped hill. No considerable or continuous range of mountains is met with until a spur of the Sierra Burro is reached, which is about twelve miles west of Ojo de Vaca. Cooke's Spring, Ojo de Vaca, and Pachetehú are depressions in the plain where springs bearing these names are found, and which are well known to those who have traversed this region. In the Burro Mountains is a fine spring called by us "Ojo de Inez," with several pools of water in the valley adjacent. Besides these, our surveying parties discovered other springs and pools of water near the hills, as well as in depressions on the plain, which, if opened, would furnish a good supply. Then we have also the large body of water west of the El Paso, known as Lake Guzman, and the River Mimbres.

The Mimbres rises in the Rocky Mountains, and, after coursing through the plateau, discharges itself, when full, into Lake Guzman. It seldom reaches that lake, however, its waters being absorbed or lost in the plain. Its sources have never been traced, but, as far as known, it must flow about one hundred and thirty miles when full. I found it dry thirty miles south of an encampment at the Copper Mines (Fort Webster) in July. The Mimbres is but a small stream, and hardly deserves the name of a river; hence its cultivable valley is narrow, nowhere exceeding a mile after entering the open plain.

I followed the stream two miles below where we first struck it and where we encamped. Here there was a thick growth of large cottonwoods; and, although the bottom was much contracted in width, it was thickly wooded and forest-like. Taking a small armed party with me then for protection, I followed the river up for about five miles where it entered the hills, and a little beyond the Rocky Mountains. I noticed all along the valley great quantities of wild roses, hops, and the Missouri currant, in some places growing so rank and entangled that we were unable to work our way through. The remains of old Indian encampments and wigwams, with fragments of pottery scattered around, showed that it was a place of resort for the Indians.

In the mountains, where the Mimbres receives constant accessions of water from lesser rivulets and springs, there are wider valleys. It runs about eight miles east of the Copper Mines; and here, on account of the excellent grazing, the abundance of wood and water, we grazed our animals. There is no cultivated ground at the Copper Mines beyond a couple of acres; and, although there are excellent garrison buildings here, the place was abandoned soon after the boundary commission left it, 1851, and Fort Webster established on the Mimbres, which afforded superior advantages. In all this region there is an abundance of pine and other timber trees. Game, too, abounds, consisting of grizzly, brown, and black bears, deer, rabbits, turkeys, partridges, quails, etc., while in the waters of the Mimbres we took excellent fish.

Santa Rita del Cobre, or the Copper Mines, was for about forty years an active mining town. The workings commenced in 1804, and, proving very profitable, a population of six hundred souls gathered around them. The hills near by furnish grazing for the animals, but for agricultural productions the population depended upon the richly cultivated districts in the valleys of the San Miguel and Casas Grandes, to the southward. A considerable trade was also carried on with the frontier towns in Sonora. The return trains took back copper or ore, much of which, owing to its superior quality, was sent to the city of Mexico, where it was used for coinage. I was told in Chihuahua that the gold found in this ore paid the cost of transportation.

I have little doubt that the region about the Copper Mines abounds in mineral wealth. Gold was found four miles from our camp, and some of our men, after leaving the commission, sunk a shaft there. They found gold, but, being ignorant of the means of washing it, and not knowing the indications of its existence elsewhere, their project was abandoned. Several fine specimens of lead and silver ore, procured near by, were also shown me; but the Apache chiefs told me they knew where both gold and silver were to be found in abundance some twenty miles distant in the mountains. They had specimens of gold, and offered to conduct me to the spot where they obtained it; but I did not think it safe to trust myself with these treacherous people, although I was on the most friendly terms with them, and excused myself from accompanying them by saying that my object was not to get gold, as they believed, but to survey the boundary. The Mexicans have many traditions of the existence of silver ore in these mountains; and I have no doubt a careful exploration by a skillful geologist would be the means of making known a very rich mining region. General Condé, when with me at the Copper Mines, assured me that he had knowledge of valuable silver ore in the adjacent mountains.

On leaving this encampment in August, 1851, we journeyed south, stopping at the springs of Pachetehú and Ojo de Vaca. The whole plateau was then covered with verdure, owing to copious rains. At the latter spring I presume there is always water, as I found it there at my several visits in May, June, and August. There are here a few acres where grass is always found. It is a watering-place for all passing trains, and has long been resorted to by the Indians.

From this point we pursued a course nearly west, entering the broad district which had never been penetrated before by any white man in modern times (as far as I know), and where we had doubts whether water could be found. At twelve miles distance we entered a cañon or defile of the Burro Mountains, which we followed up for six miles, to Ojo de Inez. This defile was thickly wooded with scrub oaks, and led to a grassy meadow, three hundred yards wide, in which were many fine springs and pools of water. We traced a small spring running through this valley for several miles, and I have reason to think that it extends to the Gila. Here would be a good point for a station on a wagon road, as I suggested in my "Personal Narrative," vol. i., p. 363. There is plenty of meadow-land, water, and wood; and, though in a secluded spot, is accessible for loaded wagons.

The next valley with water is that known as "El Cienega del Saux," i. e., Willow Marsh, though now called the Valley de Saux. This lies east of the Chiracahui range of mountains, and a corresponding range about twenty miles distant. This space is without trees. The marsh is a basin where the waters are collected from the adjacent slopes. We encamped on its margin, where there were many pools of water, but of the extent of ground thus covered I was unable, from the flatness of the ground, to form any opinion. There can be no doubt that much of this valley can be brought under cultivation, and that it must become the site of one of the principal stations on the great wagon road now constructing. The old Spanish maps exhibit a stream called the "Suanco," emptying into the Gila, which appears to run through this valley. Many villages and ranches are marked upon the map along this river, whence it may be inferred that there is an agricultural valley here. In crossing the Saux valley I noticed an arroyo or dry bed of a stream, which, during and after the rainy season, may be filled with water.

In the Chiracahui Mountains we found water in abundance. So copious indeed was the supply (although but the basin of a spring), that after all our animals, about one hundred and fifty in number, had drank of it, we could perceive no diminution. The mountain pass was well wooded, with plenty of grass. The exact position of our encampment here was latitude 32° 08′ 43″, longitude 109° 24′ 33″.

Between these mountains and the San Pedro is an undulating plain, intersected by a mountain range near the river, with brackish water in some parts. Portions of this bear a short grass, but there is no wood except in the mountain defile through which we passed, and but a scanty supply there.

The San Pedro valley is next reached, and lying some ten or twelve feet below the bottom land, unmarked by trees, the river is not observed until at its very margin. It was here about thirty feet wide and two and a half deep. Its depth varies with the rainy and dry seasons. Its valley is from a quarter of a mile to a mile in width, and in some places I was told it was still wider. This valley formerly sustained a considerable population, scattered about in haciendas and ranches, and engaged in rearing cattle. I noticed the ruins of haciendas which for years had been abandoned, and also saw herds of wild cattle roaming through the mesquit chapparal of the valley. A few days after we met with a large party of Mexicans, under Don Ilarian Garcia, engaged in hunting wild cattle, in order to obtain a supply of beef for the army, for which beef he had the contract. From him I learned that the valley was much broader farther south, and that thousands of cattle grazed there.

I am not aware that much of this valley has been under cultivation by artificial irrigation, as we did not meet with the usual traces of irrigating canals, which, when once dug, never disappear entirely. Yet such irrigation may have been employed in parts of the valley that I did not examine.

A pretty little stream, which I learned from the Mexican hunters referred to, called the Babacanora, entered the San Pedro about twenty-five miles above where we first encamped. We also encamped at this stream, near a ruined hacienda, where there were remains of an orchard of fruit-trees. The valley of the Babacanora is wide, and was covered with luxuriant grass; indeed, it was a much more attractive and apparently richer spot than the valley of the San Pedro. Its broad flats or bottoms resembled those of the Mohawk River, and it was in these, near the confluent with the latter stream, that the Mexicans were hunting the wild cattle.

Leaving the valley of the San Pedro we came upon a rolling country or prairie, here and there covered with a short grass, upon which we encountered small herds of mustangs. This grass was eagerly eaten by our animals. On these plains we found many depressions with pools of water. One of these depressions led to a small running stream, coursing through a level bottom, which we traced for about fifteen miles. This was studded for a portion of the distance with large oaks and sycamores, and resembled a highly cultivated English park; yet solitude reigned around, and there was no evidence that it had ever been inhabited by white men. Farther on, near where the stream forced its way through the mountains known as the Sierra Santa Rita, we found the ruins of a hacienda, with a tract of rich bottom land near. On this bottom there were cottonwood trees of immense size. The stream, which is here about twenty feet wide, empties into the Santa Cruz near the hacienda of Calabaza.

The whole district lying between the valley of the San Pedro and the Santa Cruz may strictly be called a grazing country. It is well watered by the streams mentioned and by the many small pools. As we approached the lofty Sierra de Santa Rita we crossed several arroyos lined with trees, showing that after the rainy season there is a great abundance of water here.

We now approach the Santa Cruz River and its valley, unquestionably the finest agricultural district in the whole of the Gadsden Purchase, after leaving the bottom lands of the Rio Grande. It is also the best wooded of any portion of the Territory, and in other respects presents many advantages for settlers; indeed, this valley, with its adjacent districts, where there are several rich and highly cultivated haciendas and missions, must become the granary for the future State of Arizona.

The Santa Cruz River rises in a broad valley, or rather plain, north of the town of the same name. We struck it at the base of a mountain range, where an open country, studded with oaks, lay before us. Passing these was an open plain covered with luxuriant grass, without a tree or shrub; crossing which, after being contracted between low ranges of hills, we reached Santa Cruz. This is an old town and presidio, and falls about ten miles south of our line. Flowing south nine miles to San Lorenzo, a deserted rancho, it soon after takes a northerly course, winding its way through a beautiful valley, until it is lost in the desert plain or sands, some ten or fifteen miles north of Tucson. Its entire length in a direct line, without reckoning its sinuosities, is about a hundred miles. Its width varies from 20 to 100 feet, and during very dry seasons portions of it disappear.

This valley was traversed by the earliest Spanish explorers in 1535, seduced by the flattering accounts of Cabeça de Vaca. Marco de Niza and Coronado led their adventurers through it in search of the famed cities of Cibola, north of the Gila; and before the year 1600, its richness having been made known, it was soon after occupied as missionary ground. Remains of several of these missions still exist. The mission church of San Xavier del Bac, erected during the last century, is the finest edifice of the kind in Sonora. Tumacacori, a few miles south of Tubac, was the most extensive mission in this part of the country. The extensive buildings, irrigating canals, and broad cultivated domain here at once attest its advantages.

The towns and settlements in the Santa Cruz valley are Santa Cruz and San Lorenzo (south of our line), Calabazas, Tumacacori, Tubac, Sopori, the mission of San Xavier, and Tucson. Santa Cruz, Tubac, and Tucson were presidios. With the exception of Santa Cruz and Tucson, this entire valley was abandoned to the savage Apaches at the time of my first visit in 1851, and the population of these was greatly diminished; indeed, but for the military the Indians would have had entire possession of it. At Calabazas a small stream enters, upon which are fine bottom lands. At Sopori is another extensive hacienda, with a broad domain and fine bottom lands. Between Tubac and San Xavier is the finest timbered district in the country; it extends from the river to the base of the mountains, and is apparently several miles in width. The timber is wholly mesquit, of a larger size than I noticed any where in the Territory, except in the valley of the Colorado. This timber must be of incalculable value both for railroad and mining purposes. For building purposes it is too hard and crooked. Besides, the cottonwood is found on the margin of all streams; it is of rapid growth, and well adapted for building.

Tucson, the most northern presidio in Mexico, once contained three thousand inhabitants. In 1851 it had dwindled down to less than five hundred, and I understand now contains between one and two thousand. The valley here is wide and rich. The large and picturesque haciendas, and the wide-spread system of irrigation which every where marks the plain, sufficiently attest its susceptibility for cultivation. Between Tucson and the Gila is an arid desert ninety miles across, about midway on which is a well-known *picacho*, at the base of which water is often found in pools, and where, by sinking wells, it might be had at all times.

With regard to the lands bordering on the River Gila, but a portion are susceptible of cultivation by the usual means adopted in that region, irrigation. Its valley is wooded generally with cottonwood trees, while bordering on this are "openings" of mesquit. The best portion of the Gila valley is occupied by the two tribes of Indians known as the Pimos and the Coco Maricopas. This is a tract lying 180 miles from its mouth, between the point where the road from Tucson strikes the Gila and the mouth of the Salinas. The arable lands occupied and cultivated by the Indians referred to extend from sixteen to twenty miles along the river, and are from three to four miles in width. Irrigating canals or "acequias" conduct the water of the Gila over all this cultivated district. The Indians raise wheat, corn, millet, beans, pumpkins, and melons in great abundance. Their wheat and corn they grind into flour, from which they make a palatable bread. They also raise a superior quality of cotton, from which they spin and weave their own garments; an art not acquired from the Spaniards, but which was found among them more than three hundred years ago, when the Spaniards first penetrated this country.

But the arable lands of the Gila at this point are not limited to the district occupied by the Pimos and Coco Maricopas; they extend far up that stream until it enters the mountains. I traced it up beyond the celebrated "Casas Grandes," and found the bottom land intersected in all directions by old irrigating canals of greater or less size; ruins of ancient edifices, vast mounds and tumuli, with long lines of earth-works; while the whole district was strewn with the fragments of pottery, and "metates," or stone corn-grinders, all of which went to show that a large and industrious population, familiar with agriculture and the arts of the semi-civilized Indians, formerly dwelt here.

You refer particularly to a district north of and immediately contiguous to the Gila which was examined by me. This tract is, *par excellence*, the finest agricultural district in our lately-acquired territories lying in the same latitude, between Eastern Texas and the Pacific, for the great extent and richness of the soil, the abundance and excellence of the water, the cottonwood timber for building purposes, the fine quarries of stone in the adjacent hills, and for the facility with which it may be approached from every quarter.

The district in question lies at the junction, and in a measure forms the delta of the Salinas and Gila Rivers. It lies but a little above the bed of the river, and might be, in consequence, easily irrigated. The arable bottom land is from two to four miles in width, and is overgrown with mesquit, while on the river's margin grow large cottonwoods. The river we found to be from eighty to 120 feet wide, from two to four feet deep, and both rapid and clear. In these respects it differs from the Gila, which is sluggish and muddy for the 200 miles I followed its banks. About forty miles from the mouth of the river we came to extensive remains of an ancient race. Here the table-land approached to within a mile of the river, and along its margin was an ancient canal from twenty to twenty-five feet wide and about four deep, which seemed to extend a long distance toward the mountains. From this were lateral canals or ditches, intersecting the bottom in all directions for irrigating it. The table-land was covered with mounds and the ruins of ancient edifices, while fragments of pottery, stone axes, and corn-grinders were scattered over it for miles, showing that it once sustained a large population. I learned from Mr. Leroux, the famous guide who accompanied me on this occasion, that much more extensive ruins were to be seen farther up the river, and particularly in the valley of the Rio Verde, which were built of stone. I speak of these to show the extent of the agricultural population that was formerly supported here, as well as to furnish an argument to sustain me in the opinion that this is one of the most desirable positions for a permanent agricultural settlement, with a military post, of any between the Rio Grande and the Colorado.

The Gila is not a navigable stream, but after its rise flat-bottomed boats loaded with merchandise might easily pass up as far as the Salinas, and perhaps to the Pimo villages.

The next point of interest is the valley of the Colorado of the West.

The Colorado is the largest stream between the Mississippi and the Pacific. It has many large tributaries, most of them, like itself, bordered with wide alluvial bottoms, and all well wooded; the angle, forming the delta of the Colorado and Gila Rivers, is entirely covered with a forest, and is often overflowed. The former stream where it receives the Gila is about 500 yards wide, and after passing a rocky cañon is much diminished; yet it varies much, according to the floods, both in depth and width. When our surveying party crossed the Colorado in January, 1852, they found the water (then at its lowest point) to be four feet deep at the shallowest place where it was forded. Six months later I found it thirteen feet higher at Fort Yuma, with an actual velocity of five and a quarter miles an hour, as ascertained by experiment.

The bottom lands of the Colorado at Fort Yuma, and at the Algodones, a few miles below, are exceedingly rich, are well wooded, and bear the marks of a former cultivation, irrigating canals being seen in all directions, even in the densest part of the forest. Nowhere have I seen bottom lands which could more easily be irrigated, owing to the little elevation of the banks above the stream.

Having now spoken of the agricultural districts of Arizona, and specified the arable and the grazing lands, I will speak of its mineral resources. In doing this I must necessarily be brief, for the reason that its mineral wealth, being below the surface, was not apparent to me or my party.

From the Mexicans of intelligence living in Sonora I learned that the Saukita Mountains, lying east of the Santa Cruz valley, abounded in silver. Some of these mines had formerly been worked. West of this valley, in the arid region, which has but few inhabitants, are both silver and copper mines. The copper mine "Del Ajo," and the "Santa Teresa and Sopori" silver mines, are among the most celebrated.

Many others, scarcely opened, including gold, silver, and copper, are known to exist, but which have been abandoned or were never worked for the want of means and of protection against the Indians. The want of these has led to the abandonment of valuable mines throughout the States of Chihuahua and Sonora; indeed, I was told by old residents in these states that "hundreds" of mines had thus been abandoned, a portion only having been worked to any extent.

On the old Spanish maps of the district in question there are many towns laid down in places near mountains where there are neither grazing or arable lands, and which could only have been supported by mining. In reaching those portions of the states mentioned where the population is sufficiently numerous to protect themselves, we find silver mines of great richness; but even these are but imperfectly worked, for the want of means and proper machinery. Several of these mines I entered myself, and saw a great variety of specimens of ore from others. Of gold, copper, cinnabar, and lead, I also saw many fine specimens taken from the mountains in the vicinity, all of which tended to convince me that these mountains do really abound in these metals. A careful geological survey is necessary in order to make known the mineral resources of this country. Should this be done, I do not hesitate to express my belief that such will be the results that a large population will at once occupy it. The territory, as a whole, is not an agricultural one; nevertheless, there is quite sufficient arable or agricultural land to sustain any mining population which may ever be fixed here.

It should be mentioned, too, that the finest grain region in Chihuahua is the valley of the Casas Grande, or San Miguel River, which is just south of our boundary, and that Sonora, on the opposite of the Sierra Madre, is a fine grain country.

With the hope that these crude remarks, hastily drawn up, may aid you in making known the agricultural and mineral advantages of the Territory which you have been recently elected to represent in the Congress of the United States, I am, dear sir, your most obedient servant,

JOHN R. BARTLETT.

Lieut. S. Mowry, Delegate to Congress
from the Territory of Arizona.

From John C. Hays, Esq.

Washington, D. C., February 16, 1858.

My dear Sir,—In answer to your note asking my opinion of the resources of Arizona (Gadsden Purchase), I take pleasure in saying in writing what I have already said in conversation—that I have traveled through the Territory from the Rio Grande to Fort Yuma, and that I consider it one of the finest grazing countries I have ever seen. The beautiful valleys of the streams which run into the Gila are fertile, and will sustain a very large population. I consider Arizona, especially in view of its great mineral wealth, a most desirable country for emigrants in search of a new home, and confidently look forward to its becoming, at an early day, a populous and wealthy state. Very truly your friend,

John C. Hays.

To Sylvester Mowry, Delegate from Arizona.

From Hon. Joseph Lane.

Washington, March 21, 1858.

Dear Sir,—In regard to the resources of Arizona, agricultural and otherwise, I have to say that I traveled over that country in the months of November and December, 1848, by the Rio Mimbres; the old, deserted ranches of San Bernardino and San Pedro to the settlements of Santa Cruz, Tucson, to the Pimo villages; found the climate mild, grazing good, and many rich, beautiful, fertile valleys, capable of producing corn, wheat, rye, oats, and vegetables sufficient to subsist a large population.

In short, I may say that I regard Arizona as an important portion of our country—rich in gold, silver, copper, and other valuable minerals, and decidedly the best grazing country on this continent, capable of subsisting millions of cattle without the aid of man. Over the route that I traveled there are no serious obstacles to a good wagon road; the country is rolling, but not mountainous, over which you could travel without much difficulty in a buggy at all seasons of the year. Many streams of pure water are found, though in places good water is scarce.

Very respectfully, your obedient servant,

JOSEPH LANE.

Lieut. Sylvester Mowry, Washington, D. C.

From John Nugent, Esq.

Washington, January 29, 1859.

SIR,—I cheerfully give, in compliance with your request, my views (in brief) regarding the population, soil, climate, capabilities, and advantages of Arizona.

Of its present population I know nothing. My information on the other points is derived from travel of some two and a half months through the Territory from east to west.

I have no hesitation in saying that it has very remarkable advantages of climate, and more than ordinary capabilities of soil. Some portions of it are an irreclaimable and utterly valueless desert; but the greater part consists of fine pasture-land abounding in the rich gramma and other nutritious grasses, and no inconsiderable portion has the very finest soil, of teeming productiveness, and of limitless agricultural availability. It is not a thickly wooded country, but on most of the streams there is large timber and of different varieties. Many of the valleys are of exceeding beauty and fertility, and west of the San Pedro there is some of the finest cotton-growing country in the world. The Pimos and Maricopas, even with their rude culture, already raise cotton of excellent quality.

Of its mineral wealth, except in copper, I know but little. That it contains some of the richest and most extensive copper mines on the continent I have myself proved by personal observation.

On the whole, I doubt if there be any portion of the domain of the United States east of the Colorado River that presents greater inducements for settlement to emigrants from the old states than does the Territory of Arizona. From what I have seen of it, I am not aware of any material cause why it should not become in time a thriving and prosperous commonwealth.

I have the honor to be your obedient servant,

JOHN NUGENT.

Hon. Sylvester Mowry.

From Hon. Miguel A. Otero.

House of Representatives, Jan. 29, 1859.

DEAR SIR,—In compliance with your request on yesterday to furnish you in writing what, in my opinion, was two years ago the population of that portion south of the Territory of New Mexico bordering upon the Rio Grande, and now within the limits of the proposed Territory of Arizona, and also what I believe may now be the population embraced within that region of country, excluding the western part of that Territory, I take pleasure in stating to you that the number of people residing in what is generally known as the Mesilla Valley, on both sides of the Rio Grande, could not have been less than 7000 people at that time, when I canvassed that portion of New Mexico for Congress two years ago. I had a good opportunity of judging of the amount of population in it at that time. The vote cast there was about 1000;

but I am free to say that that is no criterion by which to estimate or judge of the amount of population living there, because there were no more than one half of the voters who were able to vote in consequence of the rainy weather at that time. Many, too, were challenged on the ground that they were foreigners, and did not vote. If the weather had permitted it, and a full vote have been cast, it could not have been less than 1500 or 1700 votes.

I learn farther that since that time much immigration has gone into the country, and I have no doubt that there are now at least 2000 votes in the Mesilla Valley, and about 8000 inhabitants.

As to the population on the western portion of the proposed Territory, I had no opportunity to learn. It is my belief, however, that the population west of the Mesilla Valley can not be less than 2000 inhabitants, making, therefore, the whole population of the Territory about 10,000 or 11,000 inhabitants. It may be even greater than this, when we take into consideration not only the unsettled condition of the Mexican states bordering on that Territory, the establishment of the Overland Mail through it, both of which considerations must naturally conduce to the increase of population, but also the discoveries of gold diggings in the Gila River. These facts, doubtless, have contributed much to the settlement of the country.

Such, sir, is briefly my judgment with regard to the population of the Territory of Arizona. You know that I have no reason to overestimate the number of inhabitants there; and what I state is no more than an impartial statement of fact, which you are at liberty to make such use of as you may best think.

Truly yours, etc. MIGUEL A. OTERO.

Sylvester Mowry, Esq.

From S. W. Inge, Esq.

San Francisco, Cal., February 22d, 1863.

MY DEAR SIR,—I have received your letter stating your intention to republish simultaneously here and New York your lecture upon Arizona and Sonora, and asking me to give you my impressions of Sonora formed during a recent visit to that state. The republication of your lecture in view of the general attention now being directed to the countries bordering upon the Gulf of California will be opportune, and I regret my inability to add any thing of value to the information it will embody.

My exploration of Sonora was limited to the territory lying between Guaymas and the rich mineral district of San Xavier. The section of Sonora included between the lines of 27° and 30° north latitude presents a remarkable combination of advantages. The climate is every where salubrious, from the Gulf to the Sierra Madre, and so mild and genial that the fruits of the tropics ripen in the month of January in the foot-hills of the mountains 120 miles from the Gulf.

The surface is generally level, diversified here and there by isolated mountains, conical or table-topped, which give grandeur to the landscape without occupying much of the arable area. The soil is of great depth and richness, resembling in many localities the lands of the Caney and Brazos in Texas, but happily exempt from the malaria of the latter. The sugar-cane and other valuable staples of the tropics, and of the states bordering on the Gulf of Mexico, may be successfully cultivated. As in Alabama, the cereals will mature into a golden harvest separated only by a hedge or a highway from the snowy fleece of the cotton-plant. The mineral wealth of this state is traditional, and my examination of the district of San Xavier has confirmed the truth of tradition. In this respect

Sonora is entitled to precedence of all the states of Mexico.

Having these natural elements of wealth and greatness, with a sea-port unsurpassed in convenience and security, I anticipate for Sonora the same rapid and wonderful development that has been realized in California.

Very respectfully yours, S. W. INGE.

Hon. Sylvester Mowry, San Francisco.

From Major C. E. Bennett, U. S. A.

San Francisco, Feb. 20th, 1863.

DEAR SIR, — In compliance with your request, I take pleasure in stating that I resided in Arizona several months. During the past year I traveled from California to the Rio Grande and back, *via* Tucson.

Some portions of Arizona are valueless tracts of land, but the greater part of the country lying between Tucson and the Rio Grande is the *finest pasture-land* in America. With water, which I have no doubt can be obtained in ample quantities by Artesian boring, there are large portions that would become valuable agricultural districts. The valleys of the Rio Grande, Gila, San Pedro, Santa Cruz, and Mimbres Rivers will sustain a large population; and I am informed that the valleys north of the Gila River are rich, and heavily timbered. I constantly heard of great mineral wealth, but from my connection with the army had no personal experience in the mines. The road to the Rio Grande from Tucson is the finest natural road in the world.*

I am, sir, very respectfully, your obedient servant,

C. E. BENNETT, Major 1st Cav. C. V., U. S. A.

Hon. Sylvester Mowry.

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* General P. St. George Cooke, U. S. A., said the same thing to me, in Washington, some years ago. — S. M.

From Sam. F. Butterworth, Esq.

New York City, May 25, 1864.

Sir,—Since reading your work upon Arizona and Sonora, I have made an extended journey into those regions to examine certain mines, accompanied by three accomplished metallurgists and mining engineers. I take great pleasure in saying that I find your work accurate and reliable, and in reference to the mineral and agricultural resources of those portions of Arizona and Sonora visited by me, that your statements are confirmed not only by my own observations, but also by the written opinions of the eminent scientific gentlemen who accompanied me.

I have the honor to be your friend and servant,

Sam. F. Butterworth.

Hon. Sylvester Mowry, of Arizona, etc., etc.

CHAPTER XI.

THE GOVERNMENT AND THE MINES.

The Mines of the West: shall the Government seize them?—The Mining States: how shall they be Taxed?

THE following letters, originally published in the New York *World* of April 25, and the *Herald* of May 4, 1864, were received with so much favor, that I gladly acceded to numerous requests to publish them in pamphlet form, and have reproduced them in this volume. My own experience and knowledge of the subject convince me that they contain the essence and the truth, and are exhaustive of the subject; but I should be more than ungrateful if I failed to acknowledge the warm terms of commendation which I have received from friends known, and others heretofore unknown, including many names distinguished for sense, patriotism, ability, and high station.

To have in the least degree made clear the rights of the miner and the duty of the legislator would be gratifying, and I am glad to know that these letters have done some good. Senator Conness, in a very able letter to the Secretary of the Treasury, has taken ground in favor of a tax at the mint, or public assay offices, on all bullion, either silver or gold, assayed, coupled with a law prohibiting the exportation of unstamped bullion. The objection made to this is, that it is a tax upon the gross proceeds of the mines. It is only just to Senator Conness to say that he made this suggestion, knowing that some tax would be laid by Congress, and he thinks this the least onerous. His views, that any taxation that discriminates against the miners is unjust, are fully in accord with my own.

It is much to be regretted that senators and representatives refuse obstinately to understand this question. To those who persist in saying that these letters contain *a threat of secession*, I can only repeat, it is no more a threat than it would be to say to a blind man on a pier, "If you walk twenty steps you will fall into the sea." Those who can not, or will not, distinguish between a threat and friendly advice, will get no sympathy when they come to grief.

THE MINES OF THE WEST: SHALL THE GOVERNMENT SEIZE THEM?

To the Editor of the World:

A resolution has been introduced in the House of Representatives authorizing the President of the United States to take possession of the mines of Colorado and Arizona. Various other propositions have been made, all looking to the best mode of devising a revenue from the mineral lands for the support of the general government. It is deemed, in view of these facts, eminently proper to submit to Congress and the country some facts and arguments upon these great questions, so important to the people of the frontier, so vital to the country, and so lamentably misunderstood by the public men of the old states.

Why does not the resolution include the State of California and the Territories of Nevada, Idaho, and New Mexico? In all these the precious metals are mined to a great extent on public lands. If the President is to take possession, in the name of the United States, of a mine in Arizona or Colorado, it follows by inevitable logic that he must do so throughout all the public lands.

But what is a mine? It is not simply a portion of public lands where there is an outcrop of gold, or silver, or copper-bearing rock. A mine is a developed property, where capital and labor have produced a certain result, and which only has value according to the amount of labor and capital employed in demonstrating its extent and capacity of production. This necessitates the erection of extensive buildings, the purchase of costly machinery, sinking shafts, running tunnels and galleries, the expenditure of more or less money, often resulting in irretrievable loss, sometimes in great gain. Is it proposed, in "taking possession of the mines," to take possession also of the machinery, the houses, the mills, and the furnaces erected by individuals or companies at vast expense?

For example, the Gould and Curry, Ophir, and Mexican mines in Nevada are undoubtedly on public lands. The proprietors of these mines have expended several millions of dollars in permanent improvements, in the shape of steam-engines, mills, furnaces, and roads. In opening and bringing to the surface their ores they have expended nearly as much more. To-day they are deriving a large income from the mines, upon which they pay the usual income tax.

In Arizona, at the Mowry Silver Mines—individual property—more than $300,000 in gold has been expended in improvements, $50,000 of which went to defend the place against Indians when the government withdrew wholly its protection from Arizona. At the Heintzelman Mine probably a similar sum has been expended. At the San Antonio Mine a large amount. On Colorado River, in Arizona, at the newly-discovered silver and copper mines, a very large sum. In the Territory of Colorado, where the exclusive interest is in mining, as in Nevada, and every branch of industry dependent on it, millions have been expended in like improvements. Is it proposed, in taking possession of the mines, to take possession also of their improvements? They are all that make the mines valuable. Without them you can not get a dollar of the metals so indispensable to the country now. Does any sane man suppose it could be accomplished if attempted; or, if successful, expect any other result than the total annihilation of the only hope of redemption for our redundant and increasing currency, viz., the production of the precious metals?

If the argument is good that the President, in the name of the United States, may take possession of the "mines" (*i. e.*, the property of the miners—furnaces, mills, engines, and houses), why not take possession of all the farms occupied by our frontier farmers on unsurveyed lands, who produce grain and beef for the miners' supply, with the houses and grist-mills, and horses and cattle which they feed on the public domain? If the miners are trespassers, so are the farmers—more so, in fact, for the farmers only exist because the miners find the money to pay for their produce.

The logical sequence of this is indisputable, and the passage of such a law as contemplated, if it could be enforced, would at once put an end to our extending civilization; and the great American desert, which has been made, in spite of governmental negligence and *worse*, to "blossom as the rose," would return to its pristine worthlessness.

Leaving out of the question the State of California, where the miners' code, established in each mining district, is most wisely adopted by the Legislature and the courts as a part of the public law, precisely as usage has established the *lex mercatoria;* and where all the gold, and silver, and copper has been produced by individual enterprise or associated capital — look at Colorado and Nevada. Two great and growing states have grown up in a period wonderfully brief by the discovery and development of the mines. Hostile tribes have been subdued, cities built, civilization extended, the Pacific drawn toward the Atlantic in a friendly and eternal grasp, every branch of industry stimulated, an immense sum in actual and transferable wealth added to the commerce of the world—how? By the action of the government? Stimulated by the government? Assisted by the government? *No;* in spite of the government—without help, without interference, except for the worse—by individual enterprise, and the marvelous, indomitable energy of the people. Something by associated capital; vastly more by the strong arms and never-failing hearts of the *men* of all parts of the world.

Suppose these people had waited for the government to survey these lands, and point out and lease these mines, would Nevada or Colorado be known to-day? And do sensible men propose *now* to take the proceeds of all this labor and intelligence, and say to the miners, "You are trespassers on the public domain?" Does any sane man suppose there is power enough in this government, or any other under the sun, to do it?

The incidental revenue derived already by the country from the mines in operation is vastly more than could be obtained from any sale of the public mineral lands that could be devised, and the vast addition to the material wealth of the world, and the exhibit of our material resources, every day increasing, show conclusively the wisdom of non-interference with a policy so eminently beneficial.

An inventor of some useful machine is invested by the government with an exclusive right to his invention for fourteen years—often this time is extended. He is protected by laws in his rights, and any one infringing upon them is punished. In what does the inventor differ from the miner? The miner goes into the desert or the wilderness. At the risk of life and health, he discovers and develops a mine. He adds, as does the inventor, to the material wealth of the world; or more often he dies alone, neglected, forgotten, his bones are gnawed by the wolves, his fate unknown to his nearest friends, and his memory a blank. The inventor is rewarded and protected, and his fame is at least dear to his kin. Is it proposed to take from the rarely successful miner the property he has created, brand him as a trespasser and a criminal, and, in the name of the government, which has never helped him and his peculiar business, say to him, "Your labor, your brains, your courage, your property, belongs to the United States; go look for more, and then we will take that also?"

There is a case pertinent and on hand of the power of the government to seize a mine.

In July, 1863, the President of the United States directed the United States Marshal for the Northern District of California to take possession of the New Almaden Quicksilver Mine. General Wright, commanding the Department of the Pacific, was ordered to furnish troops to enforce the seizure. The marshal and the troops proceeded on their errand, and found the mine fortified against attack. Did they seize the mine? By no means. The excitement throughout the state was intense. The present governor, F. F. Low, leading bankers, merchants, and capitalists, telegraphed to Washington, "For God's sake, withdraw the order to seize the New Almaden, or there will be a revolution in the state." Did the miners telegraph to Washington? No. They armed themselves, and informed the superintendent of the Almaden mines by telegraph that they were coming to his assistance by hundreds and thousands, and the President of the United States, with a rare discretion, not only recalled the order, but disavowed it, or his organ disavowed it for him, saying it had been obtained by fraud, and

and the possessors remained in quiet possession of their mine.

No stronger case in support of my argument can be adduced. The New Almaden mines were possessed by foreigners. They had often charged what the miners thought exorbitant prices for quicksilver. So far from there being any sympathy for them, there was rather an antipathy against them, and yet the state rallied as one man against their being forcibly dispossessed of their mining property by order of the President of the United States, *in full view of the fact that the Supreme Court had decided that they had no title.* Can not Congress draw wisdom from this fact?

The United States once tried the plan of working mines, and all the world knows how it succeeded. Let the issue of the government scheme for working the Galena lead mines be a warning against another attempt. The danger and loss then was small. To-day both would be fatal.

How is the government to distinguish between mines on public lands and those upon the old French and Mexican grants? No title is recognized in these old grants until it is affirmed by the United States, and a patent issued. Chief Justice Field, of the Supreme Court of California, in his decision of the Mariposa (Fremont) case, full of learning—and so sound in its law that it commands the assent of every good lawyer and the concurrence of all miners—declares that the minerals belong to the owner of the grant. If to-day the government seizes a mine upon lands which prove a year hence to be upon a Mexican grant, reclamation will surely follow. The trespasser then becomes the government. Is it worth while taking such a risk?

In 1859, I asked the Hon. Jacob Thompson, then Secretary of the Interior, the question, "If a man locates one hundred and sixty acres of land, and finds a mine on it, and works it successfully, and afterward Congress should pass a law segregating the mineral lands, can his quarter section be taken from him under such law, even if the land taken up was unsurveyed?" Mr. Thompson replied, "Undoubtedly not. The taking away from the miner the land would be giving an *ex post facto* action of the law, and the government would have lost its right to reclaim by its own laches." The Hon. John Cochrane, then M. C., now Attorney General for the State of New York, was present, and was appealed to by the Secretary for his opinion. Mr. Cochrane said, "The Secretary's opinion was undoubtedly good law." I asked Mr. Thompson for his opinion as expressed in writing. He declined to give it on the ground of inexpediency, and because it was only a supposititious case. I presume Mr. Cochrane will remember, if he tries, this conversation.

A power like this proposed, if it could be made available, would give to the President an amount of patronage fearful to contemplate. Every mine now in operation would be placed in the hands of some favorite or political aspirant. The proceeds of the mine would go into the capacious pockets of the innumerable tribe of leeches who daily deplete the public treasury, and the government would derive no revenue at all from its apparent proprietorship. A case clearly in point, which I ask pardon for introducing, as it is my property of which I am about to speak.

Nearly two years ago, the Mowry Silver Mines in Arizona were seized by a brigadier general, whose name shall not disgrace this letter, and a marshal of the United States, in the name of the United States. The mines were then producing about $700 per day; in a few weeks they would have been producing $1500 per day, and by the close of the year 1861 double that sum.

By a nice little arrangement between the brigadier general and the marshal aforesaid, the mines were leased to a third party in the name of the government for $100 per month. Net result to the government: $100 per month, paid by the mine, and charged by the marshal for traveling expenses. Result to the brigadier general and marshal: several thousand dollars per month. The worst of the matter is to come. No improvements have been made at the mines to increase their product; and instead of their producing, as they can and ought, $5000 per day, they produce no more than they did two years ago; and this will always be the case if the government attempts to work the mines on its own account.

Any such legislation as this proposed at once puts an end to "prospecting," and the farther development of the vast undiscovered mineral wealth of the country. Men are not going to work, to have the profits of their labor taken from them by hostile legislation. Does the government intend to "prospect" on its own account? Where is the authority to build mills and furnaces, and houses to work the mines? And if the authority is found, where is the government to get the money to do it?

The truth of the matter lies in a nutshell. No power on earth can enforce any legislation which proposes to take possession of the mines, and the sooner this is understood the better. The people of California, Colorado, Nevada, Idaho, and Arizona will rise *en masse* against it. Therefore, let Congress be warned in time. The hold of the Union on the Pacific empire is purely one of feeling and sentiment. Touch our mining tenure with a rough hand, and you turn the warmest feeling of the strongest Union man, the most earnest Democrat, and the most devoted Republican, into hate and undying enmity. We have, through much suffering, out of your waste of worthless public domain, made thriving commonwealths. Every part of the country is benefited by our labor, and, in our own way, we daily add to this store—more to the country than to ourselves. For our part, in Arizona, neglected and oppressed by the government for years, nine out of ten of us massacred by the Indians—what we have made our own, gained by passing through the "very shadow of death," is worth more than money can purchase. Now that our property is safe and productive, and of great value, we do not propose to surrender it, nor to be called trespassers, nor to have it taken from us by legislation, nor any thing but an overwhelming force. I believe I speak the sentiments of every man who owns or works a foot of mining ground any where in the limits of the United States; and upon this point I beg the doubting to converse with any miner they know. Let any public man question my distinguished friend, Mr. Justice Field, of the Supreme Court, as to his opinion of such legislation as is proposed upon the people of California.

The only rational way to treat this subject is to devise an equitable mode of taxation, at the same time giving to actual possessors of mines on public lands undisputed tenure. The old Spanish mining ordinances—the collective wisdom of three centuries—gave to the mining interest every protection that could be devised; free importation of machinery, quicksilver, all the aids to developing the mines, gave undisputed and rigidly protected tenure to the discoverer and purchaser of mines, enforced their laborers, and demanded, in return for government aid, a fixed royalty, or tax, payable at the stamp (assay) offices in each district established for that purpose.

In the infancy (magnificent thought it is) of our mineral development no better precedent can be followed than the wisdom of the Spanish law. Give the miners titles to their mines, and impose a fair tax. It will be paid readily and honestly. If it is made onerous it will impede the opening of new mines, and thus "kill the goose with the golden egg."

While it is a great mistake to suppose all miners successful or all mines rich, it is an indubitable fact that mining is henceforth to be one of the great legitimate branches of industry in the country, inferior to none, constantly growing, and the only hope of salvation to the country from bankruptcy—the sole hope of paying even the interest on our public debt, as pledged, in gold. Let Congress touch this matter delicately. Any legislation which proposes to take away from actual *bona fide* possessors their mines can have but one of two results—a forcible stoppage of the production of the precious metals by a seizure of the mines by an army larger than that now in the field, or a rising of the people of the frontier that no army can put down. Is it wise to try the experiment?

Your obedient servant,

SYLVESTER MOWRY.

New York, April 24th.

THE MINING STATES: HOW SHALL THEY BE TAXED?

To the Editor of the New York Herald:

In your issue of Tuesday last, you say, "Mr. Sylvester Mowry has published a long letter, stating that the mining states would rebel, secede, and smash and nullify every thing, if Congress attempted to take possession of what belongs to the government in those regions."

The *Herald* has never treated any thing I have written in reference to Arizona or the Pacific slope unfairly, and I am sure it does not intend to misrepresent my letter to the *World*. But it appears to me quite clear that, in your remarks quoted above, you beg the question at issue: Do the mines that have been occupied and worked for years, without prohibition, and with the implied assent of the government, and upon which costly improvements have been made, belong to the government? The question is not, Shall the government seize its own? but, Shall it take the property of the miners?

There can be no doubt of the right and power of the government to segregate the unoccupied mineral lands, to appoint agents and scientific experts to examine and select them, and to fix a price per acre or per foot. It is purely a question of expediency; it would be, beyond question, a most foolish thing to do. Any man of sense, who examines the subject, can see this at a glance, if he looks at what has been done without government interference by individual enterprise, and counts up the vast addition to the productive power and wealth of the country derived from the mines now in operation. It is equally clear that the government has neither the right nor the power to seize the mines now held and worked by actual possessors, and, I think, until some one shows the contrary, that my letter to the *World* shows this conclusively. At least every man, whether practical miner or capitalist, who owns mining shares, agrees with me; and neither in numbers nor means are we to be despised, if it is to be made a question of force.

When did the government ever get more than the price fixed by law for unsurveyed public lands, which had been settled on, improved, and made worth thousands of dollars per acre, instead of the entering price $1 25, when they were surveyed and sold?

The sales of Leavenworth City, and other valuable points in Kansas, are a good illustration. In the very teeth of a large force of the regular army, these lands were bid off by a combination of settlers at the government price, $1 25 per acre. Any man who attempted to bid over this price was then and there killed. That was only "a tempest in a teapot;" but it is worth while remembering. The House of Representatives has done wisely in laying on the table the very extraordinary proposition of one of its members, authorizing the President to take possession of the mines of Colorado and Arizona. I congratulate the Hon. Mr. Washburne upon his very sensible remarks, "that the President could only do it by use of military power, and that might produce civil war;" and I am glad to find so eminent a Republican, and therefore government authority, so entirely in accord with the views of the miners.

There have been three propositions of decisive legislation upon the subject of the mines introduced in Congress—two in the House, and one in the Senate. They can only be characterized in their order of introduction, bad, worse, worst. Neither of the distinguished senators from California or Oregon, or the members of Congress from California or the mining territories, except the unfortunate member from Colorado, have attempted to touch this subject. Why? Because they knew its difficulties, and, knowing them, are content to "let well enough alone." It is a great pity that members or senators from the old states should not imitate their wise example. The product of their brains, and their knowledge of the subject, thus far made public, afford a new reading of an old line, "Fools rush in where wise men fear to tread."

The *Herald*, in the editorial of Sunday, May 1st, admits that mining is not always the successful business it is generally represented to be, and that its profits are not so great as generally imagined. Does it not follow from this admission that an onerous taxation would be not only unjust, but also unwise?

There are numerous mines in operation to-day which produce large sums monthly, every dollar of which goes to the further development of the mines, to the purchase and erection of expensive machinery, and, in addition, large assessments are called for from the stockholders. This is absolutely necessary for the success of the mines. Generally stockholders are poor, interest is fabulously high—from three to ten per cent. per month in mining districts on mining stocks not paying dividends. If a tax is laid on the gross proceeds of the mines, is it not at once apparent that you impede, if not absolutely stop, the further development of non-paying mines? One of the most famous of the Nevada mines, the Mexican, owned in whole or in part by Duncan, Sherman & Co., had its net income stopped for months, in a single day, by a "slide." Had the owners been poor men, and the gross proceeds been onerously taxed, the mine would have stopped altogether, and so much have been taken from the actual wealth of the country. This illustration applies with tenfold force to the mines owned and worked by poor men, struggling along, paying enormous interest —working like beavers, and living like beggars—on what, after all, may, and too often does, prove a delusive hope. It is proposed to tax such men and such property. It amounts [illegible]mply to taxing a man for what he has not got; and, wor[illegible] than that, to put to death all "prospecting," and to stop at once every mine that did not yield an enormous profit. The argument that the products of the mines should pay an extra tax, because the mines are on public lands, applies with equal force to the grain, the beef, and every product of the settler on public lands. In fact, if it is right to discriminate, the discrimination should be against the farmer or the grazier, as his work is light, and his capital nothing compared with that of the miner, while his profits are more certain. Such a policy is certainly unjust. It is, beyond question, unwise.

Hardly was my letter to the *World* telegraphed to California, with the news that Congress proposed a tax of five per cent. on the gross yield of the mines, before the wires sent back a loud remonstrance from all parts of the state. The telegram to the Associated Press says,

"Considerable excitement prevailed over the state in consequence of the proposition to tax mining produce five per cent. The policy is thought to be wrong, and the tax excessive."

A dispatch to Duncan, Sherman & Co., from their San Francisco correspondents (Alsop & Co.), which has been kindly placed at my disposal, says:

"San Francisco, April 30, 1864.

"Do all in your power to prevent the passage of the law taxing the gross proceeds of mines. It will be ruinous to California."

Again, the general dispatch of May 2d, says:

"Best mining stocks have depreciated five per cent., owing to the proposition to tax mines. Great feeling is manifested on the subject. Nothing has been heard from the interior yet."

Do you propose to fan this flame of discontent into a fire you can not quench? Is it prudent or politic to interfere with a system which has worked so well for nearly half a generation? Is the senator from Michigan wise enough to devise a scheme which will reduce to a system in Washington all the mining laws of all the mining districts in California and the mining territories? Does he, or any other public man, understand the subject so well that he can, at one stroke of his pen, "wipe out" a system which has worked so well, and which forms an integral part of the jurisprudence of California, Nevada, Colorado, and Oregon, and under which vested rights of years' standing have been established?

For many years the manufacturers of cotton goods and of iron were protected by a high tariff. To-day the cod fisheries are protected and rewarded with bounties. Is it now proposed, in the very death-agony of the republic, to strike a fatal blow, by unjust and suicidal taxation, at the very greatest hope of the country, viz., the protection of the precious metals?

The wisest thing that the present Congress can do—the only thing it can do of service to the government and justice to the miner—is to impose a fair tax on the nét proceeds of the mines. A system of mining laws can not be made in a day, if it is expected to be useful or to be enforced. The man who devises a code of mining laws which shall do equal justice to the rightful claims of the government and to the just claims of the miner—which provides a fair revenue and yet secures the title to the actual possessor of the mines, will approve himself a statesman indeed, and will deserve well of his country. His fame will rest upon a secure foundation, and "will endure, not for twenty, years but for twenty centuries."

Nothing in my letter to the *World*, nor in this, can fairly be construed as a threat. It is no more a threat than it would be to say to a blind man on a pier, totally ignorant of his position, "If you walk twenty steps forward you will fall into the sea." I have made a simple statement of facts, supported by what we (the miners, not the speculators nor "bubble" blowers) conceive to be sound argument, founded on right, equity, and justice. If these facts can be denied, or these arguments controverted, let some one undertake it. The importance of the subject can hardly be overestimated. Mr. Caleb Cushing, in a letter addressed to me a short time since, says:

"Porter, in his 'Progress of the Nation,' shows how the augmented demand for British coal and iron, by reason of the introduction of steam as a motive power, and that of railroads, saved Great Britain from bankruptcy during the generation next following the close of her protracted struggle with Napoleon and France. I look to our mineral resources, not of iron and coal only, but of gold, silver, mercury, copper, lead, zinc, as the most probable means of our salvation in the years next after the conclusion of the present unhappy civil war."

There can not be a thinking man in this country who does not believe that this opinion is sound. All that we (the miners) desire is, that common sense shall prevail, as much for the benefit of the government as for our own interests. Your obedient servant,

SYLVESTER MOWRY.

New York, May 2, 1864.

CHAPTER XII.

THE SOUTHERN RAILROAD ROUTE TO THE PACIFIC.*

Jefferson Davis on the Route of the 32d Parallel: All Routes present Obstacles; this the fewest.—Lieutenant Parke's Surveys.—Distances.—The Office Examination.—The Jornado.—Water and Timber.—Distances and Elevations.—Mr. A. H. Campbell's Report.—Temperature.—Opinions of Marcy and Emory.—Table of Comparative Lengths and Costs.—General Considerations.—National Importance of a Pacific Railroad.

I WILL now proceed to the consideration of the only remaining line, the *route of the thirty-second parallel.* I hope I am not expected to make it quite smooth, or find water at convenient distances, cultivable land, and timber continuously along the route. I know of no such route across our Territories. I wish I did. If there were a route where it was thus made easy to build a railroad, we might feel a more happy security for the future. It would bring in its train not only the construction of such a work, but that continuous population which is needful to bind the two parts of the country together. Knowing no such line, I believe it is a Herculean task to construct the road, attempt it where you will. Go on what parallel of latitude you may, all you can do is to take the least of most serious obstacles. I reached the conclusion that the difficulties were least on the thirty-second parallel; not that they were light. This conclusion was based upon the information possessed at that time. Subsequent explorations have materially improved the location upon the route, as I shall proceed to show, first describing the section from the Rio Grande to the Pimos villages. The office examination says:

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* The following summary of the advantages of the Southern Route along the 32d parallel (which traverses Arizona) is from the conclusive speech of the Hon. Jefferson Davis in the Senate of the United States, delivered in January, 1859. This extract formed the appendix to the first edition of this work. It is reproduced here, as no later investigations invalidate the statements then made. The political events which have taken place since the delivery of this speech in no wise alter the physical facts here so clearly set forth. No one could deal more fully and intelligibly with the great subject of a railroad communication across the continent than has Mr. Davis; and I have no comment to make upon his complete vindication of the Southern Route, except to say that the officers of the army who made these explorations are men who understand their duty, and have no object to subserve except to gain an honorable reputation by the fidelity and thoroughness of their reports. I am able, from personal observation, to bear testimony to the signal ability with which these duties have been discharged. It is understood that Lieutenant J. C. Ives, Topographical Engineer, who assisted Captain Whipple in his survey of the 35th parallel route, called the Albuquerque, and who has since been over both this and the 32d parallel, gives the most decided preference to the Southern Route.—S. M.

> "After ascending from the bottom lands of the Rio Grande, in traversing the region examined by Lieutenant Parke between these two rivers, from Doña Ana to the Pimos villages, one appears to be traveling on a great plain, interrupted irregularly and confusedly by bare, rugged, abrupt, isolated mountain masses, or short ranges, seemingly, though not in reality, without system. Winding around these isolated or lost mountains, or using a few passes through them, a railroad may be constructed with easy grades. Except through the mountain passes, the surface is so smooth as to require but little preparation to receive the superstructure of a railroad; and even in the two most difficult of the passes (where, in one case, deep cutting or a tunnel at the summit, near the surface, in rock, with heavy side-cuttings and high embankments for short distances, and in the other a short cut of sixty feet—probably through rock—are proposed by Lieutenant Parke to attain grades of forty-six feet and ninety feet per mile, or less by increasing distance) the natural slope of the ground may be used for a railroad for temporary purposes, and until the road itself can reduce the cost of materials and supplies to the lowest rates."

The re-survey by Lieutenant Parke shows that these two most difficult passes may be avoided. In relation to the supply of water upon this part of the route, the report of the secretary says:

"The great difficulty experienced in crossing this district is in the long distances over which no water is found at certain seasons. The survey by Lieutenant Parke was made during the dryest season of the year, and, irrespective of the springs found at intermediate points, the whole distance between the two rivers Rio Grande and Gila may be divided into five spaces, varying from eighty to fifty-three miles in length, at the termination of which large permanent supplies of water are found at the most unfavorable season of the year."

These spaces and points are:

From the Rio Grande to the Rio Mimbres	71 miles.
From the Rio Mimbres to the stream of the Valle del Saux	72 "
From the Valle del Saux to the San Pedro	80 "
From the San Pedro to Tucson	53 "
From Tucson to the Gila	79 "

Intermediate between these streams are permanent springs, and the new survey has improved the location in this respect. In his last report Lieutenant Parke states:

"The supply of water upon the plateau is limited. Along and near the proposed line it is found at the following localities, and from these the working-parties can be supplied: at Neide's Spring, at the southwest corner of the basaltic hills, east of Cooke's Springs; Rio Mimbres; Agua Fria; Ojo de la Vaca; Ojo de Inez; Valle del Saux; in the Puerto del Dado; Croton Springs; at the Playa de los Pimos; Castro Spring, near the railroad pass under Mount Graham; Pheasant Creek; Antelope and Dove Springs, at the base of the Calitro Mountains; and at Bear Springs, at the head of the Aravaypa. The distance in direct lines from one of these localities to another are as follows:

From the Rio Grande to Neide's Spring	40 miles.
From Neide's Spring to Cooke's Spring	12 "
From Cooke's Spring to the Rio Mimbres	21 "
From Rio Mimbres to Agua Fria	15 "
From Agua Fria to Ojo de la Vaca	6 "
From Ojo de la Vaca to Ojo de Inez	12 "
From Ojo de Inez to Valle del Saux	40 "
From Valle del Saux to Puerto del Dado	28 "
From Puerto del Dado to Castro Spring	30 "
From Puerto del Dado to Croton Springs	30 "

From Castro Spring to Croton Springs	18 miles.
From Croton Springs to Pheasant Creek	12 "
From Pheasant Creek to Antelope Spring	3 "
From Antelope Spring to Dove Spring	2½ "
From Dove Spring to Bear Spring	16 "

"On the San Pedro route, water is abundant and convenient at Chameleon Spring and Prospect Creek, and in the entire valley of the Rio San Pedro. Besides these permanent supplies, water is found, after the rains, on the *playas* and in depressions in the drains."

It has been argued, and I think successfully, that if the road were built, it might be worked from one supply of water to another; but that has never satisfied my mind in relation to the difficulty which presents itself in building the road. Without tanks or wells, I do not see how the road is to be built, how working parties are to be sustained, with the distances which are found upon every route which has been surveyed. The facilities for making such artificial reservoirs upon this part of the 32d parallel route are thus favorably described by Lieutenant Parke:

"For the working parties in the construction of the road, during the dry season, water can be obtained from the several above-mentioned permanent sources of supply; but this will involve, of necessity, much haulage, the maximum distance being twenty-three miles. But I am clearly of the opinion that water can be obtained at other points along and near the line of construction by sinking common wells. These *playa* formations are particularly favorable. Being basin-shaped, they receive and retain the drainage from the surrounding country, giving us natural reservoirs,* which require only to be tapped to give a constant and plentiful supply."

I will now proceed to describe the section west of the Pimos villages. The office examination states:

"We have now reached the Gila, seven miles above the Pimos villages, the elevation above the sea being 1365 feet. From this point to its junction with the Colorado, the valley of the river is highly favorable to the construction of a railroad. There will be no necessity for embankments against freshets, but trifling occasional cutting and filling; and, in those instances where the hills close in upon the river, there is ample space for the road without heavy cutting. The elevation at the mouth of the river being 108 feet, and the distance between the two points 223 miles, we have a general slope of five and six tenths feet per mile, which, from the favorable character of the ground, may be assumed as the grade of the road.

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* New discoveries of springs have been made since Parke's report, and will continue to be as the country is opened.—S. M.

"Water and fuel for working parties are sufficient, though no grass. Logs may be driven down the Gila from the Moyogan Mountains at its source, from the Pinal Lleno, and down the San Francisco and Salinas Rivers, from the pine forests on the former, and the mountains at the source of the latter.

"But it may be found more economical to receive all the supplies of lumber needed for the western portion of the road either from the San Bernardino Mountains and Pass, or from the harbor of San Pedro or Diego, or, should it be found desirable to establish one, from the dépôt near the mouth of the Gila."

Senators will perceive that I am here explaining the basis on which I formed the opinion which governs my vote in this case. I have no controversy with any body. I do not expect to satisfy gentlemen that their routes are not as good as they wish them; but I am dealing with the facts as they are contained in the reports, to justify me in the opinion which I have officially expressed, and on which I am now acting in my proposition to grant a given sum to make a railroad. I have not encountered all this labor in a mere spirit of controversy.

"The most favorable point for crossing the Colorado is at the junction of the Gila, where the river is narrowest, 650 feet wide, and has bluffs on both banks.

"The direction that the road should take across the desert intervening between it and the foot of the Coast Range depends, in part, upon the position of the pass by which it crosses this mountain chain. There are two passes known and explored: Warner's, the more southerly of the two, will require five miles of excavation in granite and mica slate for the full width of the road, the grades varying from 130 to 190 feet per mile.

"The distances from the mouth of the Gila, over the desert, to the entrance of this pass, is eighty miles; thence to San Diego is 150 miles. The San Gorgonio or San Bernardino Pass, on the contrary, is remarkably favorable. It is an open valley, from two to five miles wide, the surface smooth and unbroken, affording in its form and inclination every facility and no obstruction to the building of a railroad."

This plain, eighty miles in width, has been treated as a desert *jornado*, although there are springs and wells upon it; and the water of the Colorado, sometimes overflowing or rising in the middle of the plain, forms what is called New River. The plain is certainly deficient in water; but it is evidently a delta formation, and not a desert in the sense of being unproductive because of its constituent elements. It is all of alluvial formation, clearly once belonging to the Colorado, and habitually overflowed by it; but the deposit on the banks of the stream having enough moisture and tenacity to catch the sand driven upon it by prevailing winds, at last became a natural levee or barrier sufficient to restrain the floods, and long drought rendered the alluvial plain west of the river entirely sterile. Thus, I am informed, it is now along the Rio Grande. When the cultivation of a field is abandoned, left for but a few years without irrigation, sterility ensues; but it can be restored to fertility by again supplying it with moisture.

The supply of timber upon this whole route is deficient. The points where it may be obtained are thus stated in the office examination:

"Let us assume the most unfavorable case for supplies of ties and lumber over that portion of the route between the eastern limit of the Llano Estacado and the summit of the San Gorgonio Pass, 1052 miles—that is, that they must be brought from either end of the road, say 300 miles from the eastern limit of the Llano Estacado, and from the port of San Pedro on the Pacific, 100 miles from the summit of the San Gorgonio Pass, making the points of supply 1400 miles apart: the greatest distance to which they must be transported from each end is, therefore, 700 miles by the road, the point of junction of supplies from the east and west being about 110 miles west of the Rio Grande. Lumber can undoubtedly be procured in the Red River district for $30 per

1000 feet. The additional cost for transportation to the Llano, 300 miles by the railroad, at three cents per ton per mile (double the usual cost on eastern railroads), is $13½, and its cost there $43½ per 1000 feet; the cost per 1000 feet for 450 miles additional transportation is $20, and hence the cost per 1000 feet at this extreme point will be $63½. The mean cost over these 400 or 450 miles from the eastern limit of the Llano Estacado will be $52½ per 1000 feet. From Fulton to the Llano it is unnecessary to estimate its cost.

"Lumber may be delivered at San Pedro or San Diego from Oregon for $30 per 1000 feet. Abundance of it can be got out from the San Bernardino and other mountains near the line of the road at that cost, and it may be assumed, therefore, to be supplied at San Pedro or San Diego at that price, and at a mean cost over the road (the road supplying itself, as it must do, sections of 40 or 50 miles being built at a time) of $46 per 1000 feet.

"The worst case having been discussed, it remains to be said that good ties and lumber can be obtained from the Guadalupe and Hueco Mountains, from the head waters of the Rio Mimbres, from the Pinal Lleno, Salinas River, and head waters of the San Francisco, and from the San Bernardino Mountains* of the Sierra Nevada or Coast Range, which sources of supply may be found to materially obviate the necessity of transporting lumber from the two ends of the road."

In fine, it may be said that the route of the 32d parallel from the Mississippi River to the Pacific Ocean is the shortest of those explored, its length being from 100 to 400 miles less than the shortest of the other routes; it is likewise the shortest route to San Francisco, being 100 miles shorter than any other. The vast uncultivable belt through which all the routes must pass is crossed by the route of the 32d parallel where the width is least, its length through this region being 200 miles shorter than any other line. The mountain region on this route has the least elevation, and the table-lands preponderate to a greater degree than on the other routes.

It is the most economical route; the estimated cost to the Pacific being from eighteen to twenty million dollars less than that of any other, and to San Francisco $10,000,000 less; the cheapness of the construction being due to the great extent of plains and table-lands, where the road-bed preparation required is slight.

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* And from the Santa Cruz and Santa Rita Mountains in Arizona, near the line of the road, a section of Arizona never examined by Lieutenant Parke.—S. M.

The mountain passes are open, and their natural slopes admit of temporary use without costly preparation. The winters are so mild that no difficulties, impediments, or dangers from snow and ice are to be apprehended, and this admits of the use of steep grades, and greatly facilitates construction.

On all the routes unusual means must be resorted to for supplies of water at the distances common on railroads. The intervals between the large permanent supplies on the route of the 32d parallel are not too great for the working of a railroad, but additional supplies, at shorter distances, may be collected by tanks or wells.

In the uncultivable belt that separates the Mississippi valley from the Pacific slope, occasional areas of arable soil are to be found. The route of the 32d parallel is neither less favorably situated in this respect, nor in mineral wealth, than those in other latitudes, nor is the supply of building materials and timber materially less on this route than on the others, excepting an interior portion of the route near the 49th parallel.

In confirmation of the opinion expressed in the secretary's report upon the comparative advantages of the 35th and 32d parallel routes, I wish to refer to the testimony of a civil engineer who has traveled over both, and looked at them with a view to the construction of a railroad—Mr. Albert H. Campbell. He was first connected with Captain Whipple's party for exploring the route near the 35th parallel; subsequently with that of Lieutenant Parke when re-examining the route near the 32d parallel. I intend to read from a letter which I find addressed by him to the Hon. Guy M. Bryan, of Texas, in relation to the Pacific railroad, published in 1858. On the first page he sets forth his total indifference as to which of the two routes may be selected, and the absence of any pecuniary motive to influence him in one way or the other. He says:

> "I have no pecuniary or landed interest in the El Paso route, and consequently have no motive for my preference, except an honest conviction, derived from personal observation, that it is emphatically the most practicable, cheapest, and shortest route between the Mississippi River and the Pacific Ocean; and the country through which it passes, as a whole, will compare favorably with any other route in agricultural and pastoral resources, and in mineral wealth, and that it is the only route that can be successfully worked during the entire year."
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> "It is practicable to construct a railroad along the Albuquerque route, as reported by Captain Whipple; but I maintain, and am willing to leave it to the decision of the ablest impartial railroad engineer in the country, that it can not be done without an immense outlay of treasure in preparing a road-bed, and exceeding by at least twenty-five per cent. the cost of constructing a road of equal length over the 32d parallel."

Of the climate he says:

> "In regard to the climate of winter on the Albuquerque route, I am satisfied that it will be found too cold to work a railroad successfully for at least three, if not four months of the year. The recorded experience of six winters at Fort Defiance, only twenty miles in latitude north of Campbell's Pass, and about the same elevation—as I observed when I went to that post in November, 1858, through Campbell's Pass, though the Army Meteorological Register, page 641, put it down (or rather up) to '7200 (?) feet' above the level of the sea—must be taken as conclusive of the fact of its being at times extremely cold.
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> "At Albuquerque, according to the meteorological report of the medical department of the United States Army, the maximum and minimum temperatures respectively were, for the winter months of 1849 and 1850—in December, 58°, 5°; January, 49°, 12° below zero; February, 57°, 17°. For 1850 and 1851—in December, 52°, 5° below zero; January, 57°, 6°; February, 59°, 7°. For 1852 and 1853—in December, 65°, 21°; January, 65°, 19°; February, 66°, 13°. For 1853 and 1854—in December, 66°, 20°; January, 63°, 5°; February, 67°, 13°; and in December, 1854, 58°, 19°.

"At Fort Defiance, about twenty miles north of Campbell's Pass in latitude, and from 300 to 500 feet higher, the maximum and minimum temperatures respectively were, for the month of December, 1851, 62°, 4°; 18 inches snow. For 1852 and 1853—in December, 50°, 2°; January, 55°, 7°; February, 56°, 6°. For 1853 and 1854—in December, 57°, 6°; January, 49°, 20° below zero; February, 54°, 2°. For 1854 and 1855—December, 65°, 10°; January, 59°, 17° below zero; February, 61°, 13°. For 1855 and 1856—December, 56°, 25° below zero; January, 54°, 8° below zero; February, 51°, 3° below zero.

A great error has been committed in supposing that because the 35th parallel route is in a southern latitude, it must be in a warm country. Temperature depends as much upon elevation as upon latitude; and fertility results, not from the constituent elements of the soil alone, but from the meteorological conditions of the atmosphere also. Here is an elevation of 7000 feet above the sea, and a country of extreme aridity. The air from the ocean deposits the moisture it possessed in passing over the mountain ranges before it reaches this plain. Over it broods a forbidding sterility, and across it the winter winds sweep with a degree of cold scarcely less intense than that found in any portion of our country. At the close of this table the writer says:

"The table above will give a fair idea of the climate of the country. The winter of 1855 and 1856 was more severe than any one known for many years. The wintry weather commenced on the 1st of November, 1855, and has continued up to the present time (March 14, 1856). The Rio Grande, at Albuquerque, was frozen over, and with ice sufficiently strong to bear a horse and carreta. Those Indians who live habitually to the north of Fort Defiance were obliged to abandon that portion of the country and move south, with their flocks and herds, in quest of grazing, on account of the depth of snow, which, in the mountains, at whose base the fort is situated, was over two feet in depth in March, 1856."—Correspondence of J. Leatherman, Assistant Surgeon United States Army; Smithsonian Report, 1855, page 287.

Speaking of the immense exposure encountered on this elevated plain in winter, Mr. Campbell says:

"The imagination can readily picture the terrible calamity which would inevitably befall a train-load of passengers *en route* for the Pacific if an accident of a similar kind should stop their progress midway upon one of those desolate artemisia districts between the Ojo de Gallo and the Little Colorado, and between the valley of the Big Sandy Fork and the sink of the Mohave, where no human habitation can ever exist between the permanent water stations."

He treats of the supply of water in the same manner as the authors of the official reports. He notices the fact that Captain Marcy, having traveled over the 35th, and then over the 32d parallel route, testified in favor of the latter as an emigrant route. Citing the opinion of Major Emory as to the route on the 32d parallel, he says:

"In an allusion to the subject of the railroad (on page 51, first volume of Mexican Boundary Reports), he [Major Emory] emphatically declares, of the advantages gained by the last, or Gadsden treaty, that it 'has secured what the surveys made under the orders of the War Department demonstrate to be the most feasible, if not the only practicable route for a railway to the Pacific.'"

The comparison instituted in the office, when the field-work of the various explorations was reported, was to fulfill the requirements of Congress, to find the most practical and economical route for a railroad from the Mississippi River to the Pacific Ocean. I am not engaged now in the investigation of that exact question, the problem being merely that of crossing the Territories; but as the practicability of effecting a connection between the Mississippi and Pacific may control in any action of Congress, a table has been prepared which presents in a condensed form the distances and the comparative cost of each route from the Mississippi River to the Pacific Ocean. Whether this estimated cost be too high or too low, it is not for that purpose needful to inquire. The object was to approach as nearly as possible to accuracy of comparison, not to give an absolute statement of the cost. This is all that has ever been claimed for the office estimates of the cost; and this is the reason why the estimates of chiefs of parties have been modified, so as to bring them to the same comparative scale. I submit the table to the Senate:

Table showing the Lengths, comparative Costs, etc., of the several Routes explored for a Railroad from the Mississippi to the Pacific.

ROUTES.	Distance by proposed Railroad Route.	Sum of Ascents and Descents.	Comparative Cost of different Routes.	No. of Miles of Route through arable Lands.	No. of Miles of Route through Land generally uncultivable, arable Soil being found in small Areas.	Altitude above the Sea of the highest Point on the Route.
	Miles.	Feet	$			Feet
Route near forty-seventh and forty-ninth parallels, from St. Paul to Seattle	1955	18,654	135,871,000	535	1490	6,044
Route near forty-seventh and forty-ninth parallels, from St. Paul to Vancouver	1800	17,645	125,781,000	374	1490	6,044
Route near forty-first and forty-second parallels, from Rock Island, via South Pass to Benicia..............	2290	29,120*	122,770,000	829	1400	8,373
Route near thirty-eighth and thirty-ninth parallels, from St. Louis, via Coo-choo-to-pa and Tah-ee-chay-pah Passes to San Francisco...	2325	49,985†	Imp'cticable.	865	1430	10,032
Route near thirty-eighth and thirty-ninth parallels, from St. Louis, via Coo-choo-to-pa and Madeline Passes to Benicia................	2535	56,514‡	Imp'cticable.	915	1080	10,032
Route near thirty-fifth parallel, from Memphis to San Francisco..............	2366	48,521†	113,000,000	916	1400	7,550
Route near thirty-second parallel, from Memphis to San Pedro	2090	48,862†	99,000,000	692	1400	7,550
Route near thirty-second parallel, from Gaines's Landing to San Francisco by Coast route	2174	38,200§	94,000,000	984	1190	5,717
Route near thirty-second parallel, from Gaines's Landing to San Pedro	1748	30,181§	72,000,000	558	1190	5,717
Route near thirty-second parallel, from Gaines's Landing to San Diego	1683	33,454§	72,000,000	584	1159	5,717

* The ascents and descents between Rock Island and Council Bluffs are not known, and therefore not included in this sum.

† The ascents and descents between St. Louis and Westport are not known, and therefore not included in this sum.

‡ The ascents and descents between Memphis and Fort Smith are not known, and therefore not included in this sum.

§ The ascents and descents between Gaines's Landing and Fulton are not known, and therefore not included in this sum.

In volume seven of the Railroad Reports, a table will be found with which this very generally corresponds, the difference being that some of the surveys having commenced at anterior points—one, for instance, at Council Bluffs, and another at Fort Smith—the estimates of the reports are made from those points. Here they have been extended to the Mississippi River. The table in volume seven is also here modified by the supposition that the reported practicability of the Cœur d'Alene Pass is correct, and thus the total sum estimated for the route near to the 49th parallel has been reduced. No additions have been made for those difficulties which, in addressing the Senate, I have stated had come to my knowledge since the preparation of my report, because information not derived from instrumental survey is not accepted as the basis of estimate.

I have only to add that, looking to the grant of land and of money with which Texas has endowed her railroad company, and to the interest which would be brought to bear for the extension of the Texas road to the Rio Grande by a company formed to build a road from the Rio Grande to the Colorado, I believe the sum of money and the grant of land contained in my substitute, although the smallest proposed by any one, will secure the construction of the road across that intermediate territory, will insure the extension of the road of Texas to the Rio Grande; and that, having reached the Colorado, California will charter a company to extend it to San Diego, to San Pedro, or to San Francisco. Most probably a company, if incorporated to build a railroad from Fort Yuma to San Francisco, would first connect with the ocean at San Pedro, and thus command a more prompt return for their investment in the road than if they awaited its final completion to San Francisco.

I have endeavored, during the progress of this debate, to ascertain how much of the land in the valley of the Santa Clara and the Salinas might inure to the benefit of a company undertaking to build a road. It is all known to be of the highest fertility, and blessed with a climate not inferior to any within the limits of the United States. If it is possible for the company to obtain near to that line even one half of the amount of land proposed to be granted, I rely upon the accuracy of Lieutenant Parke's estimates to establish the fact that the road might be built there for the land grant alone. Whenever California shall charter a company to build this road within her own limits, and that company shall ask Congress for a grant to construct it, I can not doubt that the interest of the United States will warrant Congress in making such a grant. Thus is reached the conclusion that the Texas road will be drawn on to make a junction with the road built in the Territory, and that the latter, when built to the Colorado, will certainly be extended to the Pacific. The eastern terminus of the Texas road will be available to all the roads which ramify throughout the United States, and be connected, in a very short time, with every important point from St. Paul to Galveston.

If the facts which have been thus imperfectly grouped and presented to the Senate sustain the conclusion that this result is to be attained by so small a sum of money, it may reasonably be claimed that all who desire the construction of a road across the Territory, with complete connections throughout the states, are bound to sustain the proposition which I have submitted.

My position is, that the completion of this great work is necessary to the due execution of the functions of the general government; that it will not be achieved by private capital alone, therefore that we should strike off every shackle which impedes its execution — should abandon the right to collect duty on the iron employed; give the whole limit of the United States from which to select a route; extend every aid we can constitutionally afford, and to insure the construction of the road somewhere, be it where it may, so that it is on the soil of the United States. If, by haggling over petty sectional controversies—if, by sticking in the dark, and destroying the energy of the Constitution, politicians shall defeat the efforts which have been made from session to session—shall prostrate the last hope for this road across the continent, and, thus unprepared, should we become involved in a war with the great maritime powers of Europe, they may, when it is too late to avert the disasters which have been so often foretold, have cause to pray for the mountains to fall upon and cover them from public indignation—to them may attach the blame, on us all may press the shame and the sorrow of having lost to the country a territory worth innumerable treasure, of having forfeited that the value of which can not be measured by money—the prestige of stability, progress, and invincibility, and the right to inscribe on our national shield, EQUAL TO THE PROTECTION OF A CONTINENT-WIDE REPUBLIC.

CHAPTER XIII.

THE SILVER MINES OF ARIZONA.*

The San Antonio Mine.—Aspect of the Region.—The Mowry Mines.—Scene at the Hacienda.—Pay-day.—Labor and Laborers.—History of the Mines.—Lieutenant Mowry.—Yield of the Mines.—Country and Climate.—Santa Rita Mines.—The Hacienda.—The Salero Mines.—The Ores.—Grazing.—The Sopori Ranch.—The Country and the Mines.—Prospects.—The Heintzelman Mine.—The Country.—Past and Present of the Mines.—The Ores.—Mexican Thieves.—The Arivaca Mines.—The Country.—Arizona Mining Company.—Surrounding Mining Region.—The Cahuabia District.—The Mines.—The Bahia Mines.—General Conclusion.

THE SAN ANTONIO MINE.—A pleasant drive of two hours through the beautiful valley of the Santa Cruz brought us to the hacienda of the San Antonio Mining Company, now under the charge of Mr. Yerbes, an intelligent American, who received us with great kindness and hospitality. The buildings of the hacienda do not admit of very sumptuous accommodation, but here, at least, we found, for the first time since leaving Tucson, a living nucleus of American civilization: houses with fireplaces, and fires in them; rude attempts at beds and tables; and a people who furnished us with wood free of charge, and offered us from their scanty stores of provisions whatever we needed. A mill, with smelting furnaces and a small engine, had just been erected for reducing the ores, and would be put in operation as soon as the necessary facilities for working the mine could be obtained.

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* Mr. J. Ross Browne, the famous traveler, has just returned from an extended trip in Arizona, of which he is to furnish an account through the pages of Harper's Magazine. Learning that he was to give an account of the silver mining region, I requested the publishers to insert such portions of this as bore directly upon this topic, as a supplementary chapter of my work. They kindly consented to do this, in advance of its appearance in the Magazine. I may add that I have not seen the account of Mr. Browne, and have no means of knowing how far his views coincide with my own. But it can not fail to be of interest to the readers of my work to compare with my own the views and impressions of a man who looks at the country from a stand-point so wholly different.—S. M., *San Francisco, August,* 1864.

The San Antonio Mine is situated about six miles from the reduction works, in a spur of the Santa Cruz Mountains. The ore is rich in argentiferous galena and lead, easily managed, and will doubtless yield profitable results. It is questionable if the silver lodes in this vicinity will produce so large a proportion of rich ores to the ton as those of the Santa Rita and Cerro Colorado Mountains; but it has been well demonstrated that they are deep, boldly defined, and reliable, and will, if properly worked, amply recompense the labor and capital invested in them. The magnificent grazing lands of the valleys into which the spurs of the mountains run; the abundant supply of fine oak timber on the foot-hills; the facilities for procuring provisions from Sonora, and easy access, by good roads, to the ports of the Gulf, afford them peculiar advantages, which would be greatly enhanced if we possessed the small strip of territory extending as far south as Libertad. No traveler passing through this region can fail to be struck with the sagacity of the Mexican commissioners in running the boundary-line.

THE MOWRY SILVER MINES.—Approaching these mines we found indications of life and industry. Cords of wood lay piled up on the wayside; the sound of the axe reverberated from hill to hill; the smoke of many charcoal pits filled the air; and teamsters, with heavily-loaded wagons, were working their way over the rugged trails and by-paths. Gradually the road became better defined, and the clearings more extensive, till we came to the brow of a hill overlooking the hacienda.

A more picturesque or cheering view I had rarely seen. Down in the valley of several hundred acres, almost embosomed in trees, stand the reduction works, storehouses, and peon quarters. Smoke rose in curling clouds from the main chimney, which stands like an obelisk in the centre of the mill, and sulphurous vapors whirled up from the long row of smelting furnaces in the rear. The busy hum of the steam-engine and fly-wheels fell with a lively effect on the ear; the broad, smooth plaza in front of the works was dotted with wagons and teams discharging their freight of wood and ore; and under the shade of the surrounding trees, amid the picturesque little huts of the peons, groups of women and children, clothed in the loose variegated costume of the country, gave a pleasing domestic interest to the scene. It was the last of the month, and consequently pay-day—a very welcome and important day all over the world, but especially in this isolated region, where pay-days are scarce. Such an event within fifteen miles of Santa Cruz rises to the dignity of a grand public institution. The citizens of Santa Cruz, who are not proverbial for energy, seem to be inspired with new life on occasions of this kind, and never fail to visit the mines in large numbers for the purpose of participating in the general rejoicing. For two or three days the whole hacienda presents a lively and characteristic scene. Work is out of the question, so far as the peons are concerned. Under the shade of every tree sits a group of thriftless vagabonds, conspicuous for their dirty skins and many-colored serapas, shuffling the inevitable pack of cards or casting their fortune of greasy "bobes" upon the capricious hazards of monte. The earnings of the month are soon disposed of. The women and children are left dependent upon new advances from the store-houses; the workmen are stupefied with mescal and many nights of debauch; and when all is over, the fandango at an end, and the monte tables packed up, every miner bankrupt, and no more goods or money to be had, the posse of sharpers from the border lines of Sonora take their leave.

Under the existing system of labor in Southern Arizona, the silver mines can never be developed to their full capacity, or profitably worked. The Santa Rita, Cerro Colorado, and Cahuabia Mines have been tried in this way, and the result has been invariably unfortunate. Many valuable lives have been sacrificed, and vast amounts of property lost by the treachery, dishonesty, and incapacity of this class of workmen. It may be justly contended that this is the cheapest, and, in fact, the only labor hitherto to be obtained. Indeed, $15 a month, payable mostly in goods at high prices, can not be considered an extravagant rate of wages for men who have had more or less experience in the working of mines. But that must be determined by the result. There will be no difficulty in procuring reliable white labor as soon as there is any security for life and property. The climate of Arizona is far more genial than that of Nevada, where white labor is abundant. Men can be found to work wherever they receive an adequate compensation for their services. I do not believe it would be practicable wholly or at once to dispense with Mexican labor. It can always, to some extent, be made available for the lower grades of mining operations. Under the preponderance of a higher and more intelligent class of labor, it may become both convenient and profitable.

The Mowry Mine (formerly known as the Patagonia Mine) was probably known to the Mexicans, and worked by them many years ago. The Americans first discovered it in 1858. In 1860 it became the property of Sylvester Mowry, Esq. It is situated within ten miles of the boundary-line between Sonora and Arizona, is 6160 feet above the level of the sea, and is distant 280 miles from Guyamas, on the Gulf of California.

It is not my purpose, in these casual sketches, to write a report on the condition and prospects of each silver or gold mine in the Territory of Arizona, even if I possessed the requisite knowledge of mining operations. I can only say, therefore, in reference to the Mowry Mine, that the lode appears to be large, bold, and well defined, and the ore of fair average richness. It is composed of argentiferous galena, impregnated with arsenic, and is easily reduced by smelting. Three distinct veins are perceptible, which cross each other in the principal lode. The ore which was in process of reduction at the time of my visit yielded, as I was informed, about $40 to the ton. It was not the richest, nor could it be considered a fair average. Mr. Küstel, the distinguished metallurgist, author of the "Processes of Silver and Gold Extraction," etc., visited the mine about a month prior to my arrival, and made a thorough examination of its ores and resources. From a report* made by him, it would appear that some of the ores average $350 to the ton. If the mines were properly worked, he estimates that a general average of $50 to $70 to the ton might be obtained, and he mentions among the advantages in fluxing the presence of iron ore, manganese, and lime. The result of one day's working he found to be as follows: Produce of twenty tons in silver, $1200; in lead, $480; total, $1680: expenses of reduction, mining, etc., $400; profit, $1280. This result is highly encouraging; but the probability is, a more perfect and extensive system of operations would greatly enhance the nett proceeds of the mine.

* See ante, p. 69.

At the time of our visit this property was in the hands of the deputy marshal of New Mexico, who held it on behalf of the United States. Mr. Mowry, it appears, had been arrested and imprisoned by order of General J. H. Carleton, and the mine seized under the Confiscation Act. Of the merits of the difficulty I have no knowledge. It appears, however, that Mr. Mowry was discharged by the court which tried his case. His property, I believe, has since been restored to him by order of the government.

This gentleman's career in Arizona has been singularly adventurous and varied. In 1855 he was an officer of the Federal army at Fort Yuma. An expedition which he made into the wilds of Arizona inspired him with a high opinion of its great mineral resources and a most enthusiastic estimate of its future destiny. He resigned his position in the army, and spent several years in exploring the country, and attempting to procure a recognition of its claims by government. At one period he was elected a delegate to Congress, and visited Washington for the purpose of procuring a territorial organization, but his object was defeated by sectional dissensions in that body. Mr. Mowry is well known throughout the United States. His name is inseparably connected with that of Arizona. It is a part of himself. He once declared, in a moment of passion, when his term of residence was questioned, that "he was *born* there!" Certainly no man has done more for the new territory than he, and no man loves it better. The climate of the Patagonia is unsurpassed—I might almost say unequaled. How such a paradise ever came to be christened after the chilly, fog-smitten land where "giants grow and storms do blow," I am unable to conjecture. No wonder Mr. Mowry prefers his own name, which, if not so euphonious, is at least less suggestive of howling winds and fishy natives.

After passing through the cañon of the San Lazaro, we entered a valley which opens out into a magnificent grazing range, extending nearly twenty miles to the foot-hills of the Pinitos Mountains. Groves of cottonwood of gigantic size fringe the stream at intervals of every few miles. The grass is wonderfully luxuriant, covering the valley and hill-sides, as far as the eye can reach, with a rich gold-colored carpeting. The slopes of the hills and mountains are beautifully adorned with groves of oak, ash, hackberry, and various kinds of shrubbery, through the foliage of which the bright yellow grass glistens like a patch-work of gold; and far in the distance this glowing continuation of colors is outlined by the purple peaks of innumerable sierras, shivered by some tremendous convulsion of the earth into the wildest and most fantastic forms. Such sunrises and sunsets—such marvelous richness of coloring—such magic lights and shades I have never seen equaled in Europe—not even in Italy or the islands of the Grecian Archipelago.

SANTA RITA MINES.—A small party of us resolved to visit the mines of the Santa Rita District. For this expedition we provided ourselves with a pack-mule for our provisions, and carried our own blankets on horseback. Crossing the Santa Cruz at the foot of the milpas, opposite the town of Tubac, we followed an arroyo for about four miles, when we ascended the right bank and entered a dry, elevated plain, called in this country a mesa, or table, stretching almost as far as we could see north and south, and bounded on the east by the mountains of Santa Rita, and on the west by the Santa Cruz valley and the mountains of Atacosa. It was a matter of surprise to most of us how luxuriant the grass was on this mesa, and what an inexhaustible support it affords for innumerable herds of cattle. No water, however, is to be found nearer than the Santa Cruz River and the cañons of the Santa Rita Mountains.

We found the beautiful hacienda of the Santa Rita Company now solitary and desolate. The houses have gone to ruin, and only a few adobe walls, furnaces, and the frame-work of the mill remain to mark the spot formerly so full of life and enterprise. It was sad to stand among these ruins and think how hard a fate had been the reward of nearly all the enterprising men who had built up this little community. A few years ago these houses, now empty and crumbling down in dusty fragments, were replete with busy life; the reduction works were in full blast, and every heart thrilled with the brightest anticipations of the future.

Mr. Poston, who had done more, perhaps, than any other man to develop the resources of this vast mineral region, had some depressing reflections as he gazed upon this scene of ruin.* He had suffered too much, however, in Arizona, and seen too many reverses of fortune to waste much time in retrospection. The future was still bright and promising. It would not be long before these tenements would be again inhabited, and the sounds of life and industry again enliven the place. With the necessary protection now promised, the company is prepared to re-establish the works. An experienced manager, Mr. Wrightman, who has had long experience in this region, is now on the way out, and probably not more than a few months will elapse before the mines and hacienda will be occupied by a large working force.

At the distance of a few hundred yards from the hacienda is a silver lead, situated strangely enough in the valley, close by the bed of the creek, upon which some explorations have been made. An assay of the ore, made in 1861, yielded $400 to the ton. Water is furnished by the mine itself, which is not considered a disadvantage in this country, where that element is the great desideratum.

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* I am glad to learn that my friend Poston has recently been elected delegate to Congress from Arizona.—J. R. B.

THE SALERO MINE.—A mile beyond we reached the foot of the Salero Mountain, near which, in a pleasant little valley, stand the ruins of the peon houses, once occupied by the operators on the Salero Mine. The surrounding hills are clothed with a rich growth of grass, and there is an abundance of oak timber scattered over these hills and the adjacent mountains to supply the requisite fuel for the reduction works for many years. Water is found in an adjacent cañon a few hundred yards from the quarters, but not in sufficient quantities for stock. There would be no difficulty, however, in increasing the quantity by digging.

The Salero, which is the principal mine in this region, is situated in the side of a conical mountain of the same name, rising immediately from this little valley, and presenting some very striking mineral phenomena. The shaft is seen about a third of the way up its face, and is approached by a wagon-road, which cuts and leaves exposed a number of veins running into the mountain in nearly the same direction, and all bearing more or less indications of silver.

During the afternoon and on the following day we visited at least fifteen or twenty distinct mines, all partially opened and well tested, forming what might be termed a perfect network of silver-bearing ledges. Among these were the Salero, Bustillo, Crystal, Escarnacion, Candor, and Fuller, each one of which has yielded, under a very imperfect system of working, at the rate of from four to fourteen hundred dollars to the ton. This, of course, was from selected ores. The average would probably not fall short of two hundred dollars, though sufficient work has not yet been done upon which to base a reliable calculation. The assays and experiments of such men as Küstel, Pompelly, Booth, Garnett, Mainzer, Blake, Dr. Jackson, of Boston, and others, demonstrate, at least, that there is a great abundance of rich ores in the Santa Rita District.

As a grazing country for cattle and sheep, the valleys and foot-hills of the Santa Rita can not be surpassed. Grass of every variety known in Arizona covers the ground all the year, and there is practically no winter for live-stock. The climate is so mild, even in the months of January and February, that it is a positive luxury to sleep in the open air. Wood can be obtained in limited quantities in the neighborhood; and when that is exhausted, the valley of the Santa Cruz, only twelve miles distant, furnishes an inexhaustible supply. The mines abound in ores easy of reduction by smelting, and they are so situated that access to all of them by good roads can be had at a small expense. The transit to Tucson and Guaymas is over the best natural roads in the world, but will require military protection for some time to come.

The Sopori Ranch, although at present uninhabited, possesses advantages as a mining and grazing region which have long since given it a reputation in Sonora. Embracing over twenty square leagues of mountain and valley, it comprises within its boundaries some of the best silver and copper leads and cattle-ranges in the country. During the greater part of the year it is well watered; but there are times when water is scarce, except in the vicinity of the head-quarters, where the supply is never-failing. By means of acequias, a considerable extent of bottom-land, of a very productive quality, has already been cultivated. The usual cereal crops thrive well here, and esculents are especially fine. Wood of many valuable varieties, such as oak, ash, walnut, cottonwood, willow, and mesquit, grows in the ravines and along the margin of the creek. Lying twelve miles south of Tubac, bordering on the mission lands of San Xavier del Bac to the north, and distant but forty-five miles from Tucson, on the highway to the Cerro Colorado, Arivaca, and Sonora, it possesses great advantages of location, and a climate unrivaled for its salubrity.

I spent the afternoon rambling over the hills, making sketches of the scenery, which, at this season of the year, is Italian in its atmospheric coloring. Indeed, that land which possesses the "fatal gift of beauty" is fairly outrivaled by the Sopori.

The principal mine, which I also visited, is about two miles from the head-quarters. As yet the lode has been but little explored. A shaft has been sunk, from which some very rich ore has been taken, portions of it in small particles of pure silver.

I do not believe, however, from my own casual observation, that the mother vein has yet been struck. The average of ores taken out, and upon which experiments have been made, demonstrates a yield of $150 to the ton, and this by the rudest process of smelting. Selected specimens have yielded $700 to the ton. Still, the vein does not appear to me sufficiently defined at the point now reached to warrant the belief that large results can be expected without farther exploration. Mr. Bartlett, I believe, has taken a great interest in the development of this region, and has organized a company at Providence, Rhode Island, for the working of the mines on an extensive scale.

The whole country bears strong indications of rich mineral deposits. The Mexicans, for many years past, have worked some gold placers in the ravines of the neighboring mountains; and we saw the remains of arastras where they had formerly ground and smelted silver ores. All this district of country needs development. With capital, energy, and patience, it must eventually become one of the most valuable mining districts in the Territory.

THE HEINTZELMAN MINE.—An early start enabled us to reach, by noon, the Heintzelman Mine, or, as it is more commonly called, the "Cerro Colorado." This celebrated mine belongs to a company of New York capitalists, known as the "Arizona Mining Company." The distance by the road from Tubac is as follows: To Revanton, 8 miles; Sopori, 5; Cerro Colorado, 11: total, 24 miles. A much shorter road could be made across the foot-hills of the Atacosa range of mountains, but the work would be attended by considerable expense. From Sopori, the road now used is the public highway to Altar, Saric, and other points in Sonora, and will probably form a branch of the projected route to Port Libertad, on the Gulf of California. It runs through a broad open valley, abounding in groves of walnut, oak, ash, and mesquit, fringing the bed of a creek which is usually dry at this season. Numerous arroyas, extending down from the gulches of the neighboring mountains, in which the sands are drifted by the floods of former years, show that the country is not always so destitute of water as it is at present. The valley extends nearly all the way up from the Sopori to the foot-hills of the Cerro Colorado. It is covered with a luxuriant growth of grass, and is one of the finest grazing regions for cattle and sheep I have seen in the Territory. Sufficient water for stock can be had any where along the bed of the creek by digging a few feet. On the north side there is a rise of several hundred feet to the level of a mesa, which extends as far as the eye can reach toward San Xavier del Bac. This plateau is dry and rocky, but produces fine gramma grass, and furnishes an inexhaustible range for sheep. To the southward lie the rolling hills that join the Atacosa Mountains. These are also covered with grass, and dotted with palo-verde, mesquit, and cactus. Deer is abundant in this region, having been but little disturbed during the past few years. We killed two as we traveled along the road, and saw many more. Wild turkeys, rabbits, quails, and other game also abound in great numbers, so that we had no difficulty in keeping the camp well supplied.

I was surprised, on our arrival at the mine, to see the amount of work which had been done at this place. The head-quarters lie on a rise of ground about a mile distant from the foot of the Cerro Colorado, and present, at the first view, the appearance of a Mexican village built around the nucleus of a fort.

Scarcely three years ago the hacienda of the Cerro Colorado presented probably the most striking scene of life and energy in the territory. About a hundred and twenty peons were in the employ of the company; the works were in active operation; vast piles of ore were cast up daily from the bowels of the earth; wagons were receiving and discharging freights; the puff and whistle of the steam-engine resounded over the hills; herds of cattle, horses, mules, and other stock ranged over the valleys. At the time of our visit it was silent and desolate—a picture of utter abandonment. The adobe houses were fast falling into ruin; the engines were no longer at work; the rich piles of ore lying in front of the shafts had been sacked and robbed by marauding Mexicans; nothing was to be seen but wreck and ruin, and the few solitary graves on a neighboring hill, which tell the story of violence and sacrifice by which the pathway to civilization has been marked in Arizona.

We took up our quarters within the walled fortifications which mark the entrance to the mine. The works are well protected by a tower in one corner of the square, commanding the plaza and various buildings and store-houses, as also the shafts of the mine, which open along the ledge for a distance of several hundred yards. We found the steam-engine still standing within the inclosure, but rusty and partially imbedded in the ground. Remains of arastras and "whins," with various massive beams scattered about, showed to some extent the large amount of labor expended upon these works.

The entrance to the mine is close by the tower. The shaft has been sunk to a depth of a hundred and forty feet, and has been for some time partially filled with water. Poston and myself descended by the ladders as far as we could. About sixty feet of water stopped us from going any farther. I was surprised at the completeness and durability of the work—the more so, knowing with what difficulty every part of it had been accomplished.

Of the quality of the ores in this mine I am not prepared to express any opinion of my own. The best practical evidence I saw of their value was that the Mexicans had been plundering the different shafts which were accessible just prior to our arrival; and, judging from their rude system of reduction, I scarcely think they would waste time in stealing ore of little value and transporting it across the border line through an Apache country. It is well known that the town of Saric, in Sonora, has been built upon the proceeds of ore stolen from the Heintzelman Mine. I saw scattered about the premises piles of ore which had just been broken up, ready for packing away; and the fresh tracks of mule-trains and wagon-wheels, on the well-beaten road to Saric, showed how profitable this sort of enterprise must be to the Sonoranians.

THE ARIVACA MINES.—Seven miles from the Cerro Colorado we reached the Arivaca ranch, long celebrated for its rich mines and fine pastures. This ranch, called by the Mexicans *La Aribac*, comprises within its boundaries 17,000 acres of agricultural land, 25 silver-mines, formerly worked by the Mexicans, and numerous gold, copper, and lead mines, as yet undeveloped. It contains a large amount of rich meadow-land, bordering on a never-failing stream; is well wooded with oak, walnut, ash, cottonwood, and mesquit, and is capable of sustaining a population of five or six thousand souls. The range for cattle and sheep is almost without limit, extending over a belt of grazing country as far south as the Arizuma Mountains, west to the great peak of the Baboquivori, and north and east into the heart of the neighboring mountains. This goes far beyond the boundaries of the ranch; but in Arizona, as in California, the possession of water is tantamount to the possession of the whole surrounding country. The title is held by the Arizona Mining Company, and is derived from Thomas and Ignacio Ortez, who perfected it as early as 1802. It was surveyed by Lieutenant A. B. Gray, of the Boundary Commission, in 1859. Up to the abandonment of the Territory in 1861, it was in a progressive state of improvement under the auspices of the company's agent. The reduction works of the Heintzelman Mine were situated on this ranch for the convenience of wood, water, and pasturage, and were projected on a costly and extensive scale. Little now remains of them save the ruins of the mill and furnaces, the adobe store-houses and offices, and a dilapidated corral.

We camped in the old mill, and spent a couple of days very pleasantly in visiting the mines and exploring the gulches of the neighboring mountains. Game was abundant. Some of our escort who were good shots brought in several fat deer, and we lived in sumptuous style during our stay.

A couple of miles below the head-quarters is situated another mining establishment belonging to the same company, and designed for the use of certain mines in the same vicinity, one of which we visited, and found to present very favorable indications of lead and silver ore. Several buildings, in a fair state of preservation, comprise what is left of the hacienda; also a double corral for horses and cattle.

THE CAHUABIA DISTRICT.—Crossing the desert of the Papagoria, we made an exploration of the Cahuabia District. The principal mines in this district are owned by the Cahuabia Mining Company. From the Report of Mr. Mainzer, a very able practical engineer, it would appear that the silver lodes are among the richest in Arizona; but I can readily believe this to be the case from my own observation. I have seen nothing in Washoe or elsewhere that presents more favorable indications. Mr. Jaeger, our Fort Yuma friend "Don Diego," of whose history I gave a brief sketch in my first paper, owns the "Pecacho," a very rich lead, upon which considerable work has been done. A few Mexicans were engaged in getting out the ores at the time of our arrival. This mine was leased to a Mexican during the past two years, who, by the rudest system of working, managed to get about forty thousand dollars out of it, over and above expenses.

We visited the Bahia, a silver lode of extraordinary richness belonging to the Cahuabia Mining Company. From some Mexicans who were helping themselves to the ore, we learned that it yielded an average of $300 to $350 to the ton, and occasionally they struck it in nearly a pure state. There are also very fine copper mines in the vicinity. Mr. Hill d'Amit, who was a member of our party on the trip to Sonora, is largely interested in one of these, and considers it one of the best copper leads in the country—quite equal to the celebrated Maricopa lead on the Gila. Difficulty of transportation is the great drawback to copper mining in this part of Arizona. I am satisfied, from my own observation, and from the concurrent testimony of others, that the Cahuabia is a mineral region of more than ordinary richness. It abounds in almost all the precious metals, but is as yet scarcely known beyond Tucson. No finer field for exploration and enterprise exists south of the Gila.

My impressions of Arizona may be summed up in a few words. I believe it to be a territory wonderfully rich in minerals, but subject to greater drawbacks than any other of our territorial possessions. It will be many years before its mineral resources can be fairly developed. Emigration must be encouraged by increased military protection; capital must be expended without the hope of immediate and extraordinary returns; civil law must be established on a firm basis, and facilities of communication be fostered by legislation of Congress.

POSTSCRIPT.*

WARD ON THE SILVER MINES OF NORTHERN MEXICO.

Projects for Mining.—The Mines of Arizpe.—Richness of Ores.—The Balls of Silver.—Old Spanish Decree.—Criaderos de Plata.—Speculations and Prospects.

SOME Americans have endeavored to establish a company for Batopilas, but have not, I believe, as yet succeeded in raising a sufficient capital. A Mexican company for working some of the mines of Sonora was likewise proposed in the capital very lately, but failed, I believe, in consequence of a want of confidence in the persons who wished to promote its formation.

A similar enterprise will shortly be attempted in England by an English gentleman (Colonel Bourne) who has been long a resident in Mexico, in conjunction with Mr. Escalante, the representative of the State of Sonora in the Senate. They have taken up contracts for the mines of Arizpe (about 36° north latitude), in a situation possessing great local advantages—a fertile country, the vicinity of two large rivers, and a communication by water with the Pacific. The mines themselves were formerly celebrated for their riches, and the capital required to bring them again into activity is very small.

The specimens which I have seen of the ores extracted from them almost induce one to adopt the theory that the proportion of silver contained in the ores increases as you advance toward the north—a theory very generally believed at present in Mexico, and certainly confirmed by the superiority of the northern ores to those of the richest districts in the south. The idea probably originated in the discovery of the famous *bolas de plata* (balls of silver) of Arizona, in the beginning of the last century, which was, and probably still is, believed in Europe to be one of those fables with which mining countries always abound.

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* While on my way from San Francisco to visit my mines in Arizona, my attention was drawn to the following passages in "WARD'S *Mexico*," published some years ago, which throw some light upon the early history of mining in Sonora and Arizona.—S. M., *Guaymas*, Mexico, *August* 7, 1864.

But the attention of the present government of Mexico having been drawn to the subject, a search was made in the vice-regal archives, by order of the President, for the correspondence which was known to have taken place respecting it in the year 1736.

This correspondence I have seen; and I have in my possession a certified copy of a decree of Philip the Fifth, dated Aranjuez, May 28th, 1741, the object of which was to terminate a prosecution instituted by the royal fiscal against the discoverers of Arizona for having defrauded the treasury of the duties payable upon the masses of pure silver found there.

The decree states the weight of the balls, sheets, and other pieces of silver discovered (*bolas, planchas, y otras piezas de plata*) to have amounted to 165 arrobas, 8 lbs. —in all, 4033 lbs.; and mentions particularly one mass of pure silver weighing 108 arrobas (2700 lbs.), and another of eleven arrobas, upon which duties had been actually paid by a Don Domingo Asmendi, and which, as a great natural curiosity (*como cosa especial*), the king states ought to have been sent to Madrid.

The decree ends by declaring the District of Arizona to be royal property, as a "*criadero de plata*" (a place where, by some natural process, silver was created)—an idea to which the flexibility of the metal, when first extracted, seemed, in those times, to give some color of probability—and by directing it to be worked upon the royal account. This put a stop to the enterprises of individuals; the district was deserted; an attempt to send a colony there failed; and, in a few years, the very name of Arizona was forgotten.

I am far from supposing that the whole of the facts recorded in this decree can be taken as correct, although the authenticity of the decree is unquestionable. But what one can not adopt without confirmation ought not to be rejected without inquiry; and I see enough, at least, in these records of Arizona to warrant the supposition (confirmed as it is by the facts and appearances mentioned in the preceding pages) that the hitherto unexplored regions in the north of Mexico contain mineral treasures which, as discoveries proceed, are likely to make the future produce of the country infinitely exceed the amount that has been hitherto drawn from the comparatively poorer districts of the south.

In how far these discoveries must be influenced by the progress of population, and in what degree the discoveries themselves may be expected to influence that progress, remains as a subject of inquiry for the fourth and last section of this book, in which I shall endeavor to point out the connection between the mines and the agriculture and commerce of Mexico, as the best mode of illustrating the effect likely to be produced by their prosperity upon a country the general interests of which they so effectually promote.—*Vol.* i., *pages* 458–461.

THE END.